INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOL. 29 NOVEMBER, 1940 No. 9

The A.V.A. Convention

San Francisco, that western city which history and literature have so shrouded with romantic atmosphere, will be host to the large membership of the American Vocational Association when that body convenes there December 13 to 18 inclusive.

The local A.V.A. committees have been at work for months to make the convention a success. They assure us that San Francisco will have much to offer to the convention visitors, but they also call attention to the fact that the central theme of the convention, revolving as it does about the problem of linking the school with the training program for National Defense, will be of vital interest to the teachers of both industrial arts and vocational education. Administrators, who have already acquired rich experiences with the National Defense training program, even though this is in operation but a short time, will be there to tell others how this work may be made operative in their own school systems.

More information about the convention city and the convention itself will be published in the next issue of the magazine. In the meantime, however, every reader of the magazine ought to see whether or not he can perfect plans to attend this important gathering of educators.

This Issue

As has been announced in the past two numbers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, this issue presents to the readers a wealth of problems and projects. These have been chosen especially for their adaptability to both the home shop and the school shop. Among the projects offered, there are twenty devoted to metalwork, nineteen to woodwork, five in which metal and other materials are combined, and two that are of special interest to electricians.

There are also eight articles describing projects and procedures that are of general interest. Some of these latter articles may suggest procedures hitherto overlooked, which may well be introduced into the school shop or adopted by the home-shop worker.

It is to be noted also that these projects have been so selected that those who do not have access to power machinery will find jobs that will provide incentives to the beginner and challenges to the advanced mechanic.

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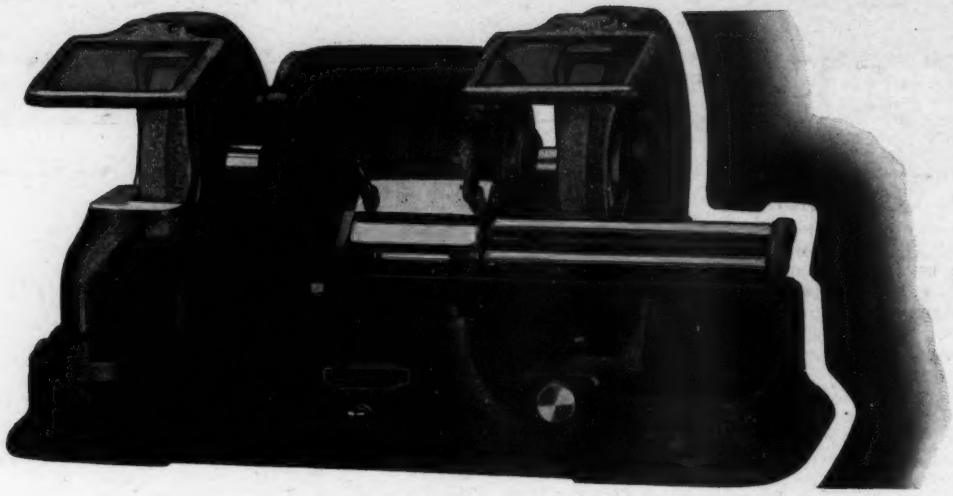

W-80
BENCH GRINDER

It isn't necessary to tell the innumerable shop instructors who use the W-80 what an excellent grinder it is . . . they know. But if *you* are still unacquainted with this machine we ask that you investigate!

First, you'll find that it is a grinder that will fit in any budget. It is surprisingly inexpensive . . . will stretch your dollars for additional equipment purchases. Then too, you'll discover that it is amazingly strong and sturdy. The heavy frame is made of cast iron . . . the entire machine is constructed to resist the heavy shock loads common in grinding.

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The final decision is up to you of course, but we're quite sure you'll agree that this is the grinder for your shop. Write now for literature . . . there is no obligation.

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Short Talks on Wood

SYCAMORE *(Platanus occidentalis)*

Locally may be known as the buttonwood, buttonball or plane tree. One of the largest of our native hardwoods. Wood is heavy, hard and moderately strong. Not durable when exposed to the weather or in contact with soil. Interlocked grain makes it difficult to split. Turns well on a lathe. Reddish brown in color.

Its main use is for furniture, tobacco boxes, food containers and butcher's blocks. Quarter-sawed sycamore has great beauty which suits it for interior trim, but for some reason it has not been utilized much for this purpose.

Sycamore is native from Maine to Minnesota and south to Florida and Texas. Prefers the moist, fertile soil along streams and in rich bottomlands. Is hardy, grows rapidly. Frequently planted as an ornamental.

When mature it may attain a height of 140-170 feet and a diameter of 10-11 feet. The trunk often divides near the ground into several secondary trunks, the massive branches forming a broad, open head.

Bark is so characteristic that the tree can usually be identified by it alone. It is greenish-gray in color, and flakes off yearly in broad scales, exposing a white or greenish innerbark. The leaves are simple, alternate, 3 to 5-lobed, 4 to 10 inches across, bright green above, white wooly below. The fruit is ball-shaped and is about an inch in diameter. It contains a great many small seeds and generally remains on the tree until spring.

YATES-AMERICAN

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Students Select School-Shop Projects

H. E. DRUM

Carrollton High School,
Carrollton, Ohio

The instructor may act as a dictator in setting up a course of study to be offered in a general school-shop class, but it is better if the individual student is permitted to feel that he is an active part of the educative process by permitting him to choose some or all of the projects which he makes in the school shop. The instructor who has been guilty of telling his students what articles they are to make, frequently finds that the things produced by his students fill no need in their homes. Such projects may be set aside in the garage or basement to collect dust, brought to light once a year during the annual house-cleaning season, until used some cold morning for kindling, or until they are thrown on the junk pile. If, instead of this, a boy could be made to realize a real need for the results of his shop labors, he would be more inclined to take an inspired interest in each project, knowing that the repaired or constructed article will be used and appreciated by himself and others when completed.

Students may be led to make a personal selection of shop projects through detailed investigation of repairs, refinishing jobs, and new articles needed in the home. This also brings the school and the home into closer contact and informs the parents about what their sons are trying to accomplish in the school shop.

The writer made such home surveys to help his students in their selection of shop projects during the past two years, and has found them very helpful. In the class discussions during the first week of school, the problem of what to include in the course of study is presented. The first discussion aims to lead students to suggest the home survey idea. Through questions and suggestions a survey outline is then set up by the class, and from this a general survey sheet is formulated which will take care of all students in the class. It is to be understood, of course, that the details of the survey are thoroughly fixed in the instructor's mind at the beginning of the discussions, but students are led to develop, and made to feel, that they are the authors of the completed survey sheet. Many revisions and additions are necessary before they complete the sheet. This process of revision often brings to light several illuminating facts not previously considered by the instructor, and stimulates initiative and interest in the content of the shop course. It is honestly felt that this approach causes disinterested and listless students to offer suggestions, and be made to feel that their ideas are respected and that their contributions are of real value to the entire class.

The following is the survey, as set up by the shop students last September:

A Survey of Home Conditions

Outside the home, garage, and outbuildings:
1. Window repair jobs... 2. Painting and repainting jobs... 3. Window-screen repair jobs... 4. New screens and screen doors needed... 5. Porch jobs: (floors, steps, etc.)... 6. New walks needed ... 7. Fence repairs, new fences... 8. Flower appliances (boxes, trellis, etc.)... 9. Chimney, roof, spouting needs... 10. Outside lights needed... 11. Outbuilding repairs... 12. ...

The Kitchen:
13. Loose hinges, catches, and pulls... 14. Stove repairs, light repairs, plumbing repairs... 15. Utensils that need soldering or other repairs ... 16. Dull kitchen knives, cleavers, and the like... 17. Repainting and refinishing jobs... 18. New furniture needed in kitchen... 19. ... 20. ...

First-floor rooms:
21. New electric outlets needed... 22. Refinishing jobs... 23. Furniture repair jobs... 24. Tight fitting doors and windows... 25. Broken glass in doors or windows... 26. Heating-system repair jobs... 27. Clothes-closet repair jobs... 28. New furniture needed... 29. ... 30. ...

Upstairs rooms:
31. New electric outlets needed... 32. Refinishing jobs... 33. Furniture repair jobs... 34. Tight fitting doors and windows... 35. Broken glass in doors, or windows, or in picture frames... 36. Heating-system repair jobs... 37. Clothes-closet jobs... 38. New furniture needed... 39. ... 40. ...

The Basement:
41. Electric outlets needed... 42. Heating and plumbing-system repairs... 43. Repairs and new articles needed in laundry... 44. Miscellaneous repair jobs... 45. Shelves, partitions, etc., needed ... 46. New appliances needed... 47. ...

Miscellaneous:
48. Toys to repair... 49. Upholstering work ... 50. Electrical-appliances repairs... 51. ... 52. ...

Tentative plans for a home workshop:
53. Tools needing repairs, handles, etc.... 54. Dull shop tools... 55. Plans for storing tools... 56. Workbench, vise, etc., needed... 57. Plans for storing brushes, nails, screws, etc.... 58. New power tools desired... 59. ... 60. ...

The survey is given each student in mimeograph form. The sheets are taken home, and, with the parents' help, the blanks are filled. On the day the completed survey sheets are due, another class discussion takes place. After listening to two or three completed lists, it is suggested that the jobs be listed under various headings. Headings such as, woodwork, window glazing, soldering, etc. The students suggest the headings.

Usually, the lists of jobs selected are too long for any student to complete during the school year. Another class discussion occurs, and a number of the less important and too difficult jobs are eliminated. Again the lists in a majority of cases are too long. Those jobs to be completed at home are re-listed under a new head. Such jobs as window glazing, concrete work, and others that cannot be done during the regular class time are to be done after school hours. To enable students to complete the home jobs satisfactorily, practice work is done in class and class demonstrations presented. The rest of the jobs are listed under the proper headings, placing the simple jobs first, the more desirable difficult jobs next, and the least useful ones at the end. This last classification is discussed privately by student and instructor, and another revision usually follows. By the end of the second week the majority of the students have selected the jobs they expect to complete during the year. A large sheet of white cardboard is ruled, and the projects selected transferred to this master sheet. This chart hangs on the shop wall during the year.

There are many changes from the original schedule set up by the individual stu-

dent at the beginning of the year. As the year passes, students may discover that certain projects are not worth while or are too difficult, and are allowed to select other jobs after reasons for changing are discussed. There may be many criticisms to offer about this scheme, and better methods of procedure may be suggested, but it has the advantage of having students use considerable time and thought in selecting their shop projects at the beginning of the school year. It helps the instructor to teach his students how to plan carefully, and it helps him keep them working on a plan which they themselves have created.

Thanksgiving — For What?

DEAN M. SCHWEICKHARD

Assistant Superintendent of Schools, Minneapolis, Minnesota

The Force of Contrast

The arousal of interest is probably the most potent factor in the initiation and perpetuation of human action. When attention has been attracted and interest aroused mental or physical action usually results, but the problem often lies in the discovery of the necessary initial stimulus.

Such a stimulus is frequently supplied in the contrast which exists between things of unlike nature. Sound sleep is usually disturbed by a sudden noise in the night when all else is still. A sleeper accustomed to a steady noise is just as easily awakened if that noise suddenly ceases. Similarly the sudden appearance or disappearance of a light in the dark commands attention.

The common element which seems to pervade such situations is that of contrasting condition. The phases of human experience where contrast plays an important role are those which involve such things as color, form, size, amount, height, depth, character, temperament, texture, work, play, food, houses, cars, wealth, health, and innumerable others. A cloud against a blue sky is always more interesting than a completely cloudless sky or one fully shrouded in gray. A landscape of rolling hills and valleys attracts more pleasure seekers than the unbroken prairie. The secret lies in the contrasts involved.

As one stands by and observes contrasting scenes and conditions from an objective point of view, his reaction brings varying degrees of interest so long as the panorama serves to reveal differences not directly affecting himself. As soon as the contrast begins to involve him the interest continues and may be intensified, but takes one of two directions. It is pleasing and satisfying as long as the contrast is favorable, but begins to be perplexing and disturbing as soon as it becomes unfavorable.

The Secret of Thanksgiving

Like many other forces which affect human personality this one of contrast may be used for good or ill. Myriads of opportunities exist for both favorable and unfavorable comparisons. The family who lives in a simple home may make themselves unhappy by constantly comparing it with the mansion on the hill, or extremely happy and thankful in contrast to the family who must huddle together in a shack. The student who must carve in soap gains little by longing for marble, but may grow a sculptor's spirit and develop a skillful touch by working in the medium at hand. Looking for favorable comparisons furnishes one with a foundation for a living spirit of thankfulness.

In some minds an attitude of thanksgiving is synonomous with passive acceptance of one's entire situation in life. The same sort of reasoning would stamp any other attitude as one of inner rebellion and diametrically opposed to anything approaching a thankful spirit. Such an attitude is a false one for it fails to recognize that the course of life need not be a choice between resignation and bitterness, but may rather be between stagnation, which either of these represents, and progress which comes from a sense of thankful satisfaction over past attainments.

Confusion sometimes arises in this connection because of the difficulty encountered in attempting to mingle a feeling of true thankfulness in the heart with one of jealousy, covetousness, or avariciousness toward the prized possessions or accomplishments of others. These two attitudes will not mingle, and indeed they need not, for it must be remembered there is a vast difference between seeking to accomplish what others have accomplished because we admire their accomplishment, and seeking to do so in order that we may equal or excel someone else in popularity or fame.

The Pilgrims had little in the way of possessions or conveniences as we know them today, but they sallied forth in an attitude and a spirit of thanksgiving and devotion. They were extremely thankful but not content. The secret of their thankfulness lay in the contrast of their situation with what it had been, and with what it might have been.

The Renewal of Hope

Today perhaps some may have come to look cynically upon the thought of Thanksgiving because conditions in recent years have appeared in such decided contrast with those of a little more than a decade ago. Thanksgiving then came to be looked upon as a celebration of national prosperity, material welfare, economic security, and the plenty which was symbolized by heavily laden tables. Rather than comparing our situation today with that sort of condition, suppose we compare it with the conditions which faced those venerable forefathers. On that first Thanksgiving Day in America they had barely escaped the calamity of extermination. They were solemnly commemorating one of life's darkest hours, but most of all they had turned their backs upon those discouraging things and were looking into the future with brighter hope.

The years which have intervened have brought good times and bad. There have been times of war and times of peace, times of industrial expansion and times of widespread unemployment. If there is one continuing lesson to be learned from the nation's past experience, surely that lesson is one of enduring survival. Discontent, adverse conditions, economic catastrophe, financial insecurity: these to our history are an old story oft repeated. There is hope and encouragement, however, in the fact that in the past we have always been able to weather those adversities and each time to emerge into a new era rich in opportunity. In the mood of the nation the darkest hour has always been that before the dawn of a new day. World affairs are gloomy at this Thanksgiving time, but in America there are many signs that the gloom may pass and the dawn appear.

One great source of confidence lies in the way by which we have come to where we are. Industry and business have been built upon sound foundations, and training for them has been woven more and more firmly into our system of education. We take great pride in the industrial facilities of our country, and in the training for them which is now so well provided in our schools, and well we may for they are essential to the maintenance and defense of the welfare and happiness of our people. But to trust in these things alone will lead us to destruction. We must keep alive our faith in our fellow men and our hope in God.

Many periods have looked like the evening of the world. Suddenly someone paints a picture and burned-out imagination is rekindled; someone writes a book and inspiration springs forth; someone conceives an ideal and man's best effort bursts forth into freedom, justice, and righteousness. Are the possibilities of these things dead today or are the solid foundations laid for them as firm as ever if we would but seek them? Perhaps a daybreak is at hand, a continental shore line so to speak, emerging out of the mist, a rock upon which we may effect a successful landing and continue the building of a nation for which we may be thankful.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

GUARD RATHER THAN HAVE ACCIDENTS

The Power Press Safety Bulletin of June, 1940, describes an accident which caused an engineer in a testing laboratory to lose one finger and have two others badly fractured. This engineer was testing a ventilating fan which had been designed for a generator. In running the test, he made use of a V-belt. While taking temperature readings, he inadvertantly caught his hand between the V-belt and the generator pulley, causing the mutilations just mentioned.

Naturally, that very same day, strict orders were issued to laboratory engineers to guard all belts, pulleys, or other dangerous moving parts even though they are to be operated for only a short time.

The reading of this news note reminded the writer of an incident when his life was spared only because two swiftly moving parallel belts became entangled three minutes later rather than three minutes earlier. He had gone to the testing room of the plant in which he was employed to get some data from the man who was running a test on a new machine which was to be shipped the next day. The man engaged in making the test was taking the speed of one of the pulleys of the machine, so for a few moments he and the writer were both squatted near the shaft which was to be hurled through the air a few minutes later. Fortunately, both he and the man making the test had left their position at the machine before the belt entangled, tearing two cast-iron hangers off the floor and throwing a piece of mechanism weighing at least 500 pounds through the air for a distance of twelve feet.

Here, too, a simple temporary barrier guard would have been sufficient to have prevented the accident. Accidents such as these may happen in any school shop. It is well, therefore, to adopt the safe rule of never allowing the operation, even for the shortest time, of any moving shafts, pulleys, belts, gears, cutters, and the like, without having them guarded so that students will not be maimed or probably killed while being instructed in the art of running modern power machines.

FLEXIBILITY AND ADAPTABILITY

The charge is frequently heard that schools are very slow to adapt themselves to current conditions, that they are inflexible, and that they are incapable of adopting the energetic methods so commonly ascribed to business and industry.

Those who make these assertions forget that schools are frequently hampered by lack of money. To make far-reaching changes, whether in school, business, or industry usually takes large quantities of money. Budgets are quite inflexible, however, especially school budgets that have been cut down until they hardly permit the offering of more than the merest essentials.

What can be done, however, when money is made available, is demonstrated amply by the manner in which many schools have adapted their shops and their programs to the demands and needs of the National Defense Program.

An outstanding example of this readiness to serve has been furnished by the Milwaukee Vocational School. Nationally known as one of the outstanding educational institutions for the training of America's 85 per cent, it quickly mobilized its human and material forces to assist in the training of men as required by the defense program.

Since the opening of the school year, however, it was found that all of the vast offerings of this school would be taxed to their full capacity in the accommodation of just its ordinary load of students. A plan was then worked out to take care of the defense program trainees by conducting classes for them during the night. With the program now working, this school has become an institution that is functioning twenty-four hours per day.

The regular evening shop classes have been scheduled so that they end at nine in the evening. Then one group of the trainees under the National Defense Program takes over the shops until 3 a.m. These students are then replaced by another group which remain until 9 a.m. when the regular day classes start.

The program, as it has been worked out to date, accommodates ten classes for machinists, one for patternmakers, two in the foundry, two for electricians, two for sheet-metal workers, four for machine draftsmen, four for welders, two in Diesel engineering, four in auto service, and two in metallurgy.

The students under the National Defense Program are enrolled for ten weeks. This is equivalent to three hundred training hours spent intensively on a limited number of tool operations, so that the trainees can enter industry fully equipped to do a specified type of work.

Other vocational schools in Wisconsin and probably some schools elsewhere are working on night shifts. The administrators of these schools have shown that they were enterprising enough to work out a solution to a knotty problem which might otherwise have necessitated an entirely different training program.

THE STRANGE WAYS OF MAN

It is extremely interesting to read that beryllium, an element discovered about 150 years ago, has so many advantageous characteristics which will prove decidedly worth while to industry. Research studies on this metal occupied a period of seven years, and they disclosed almost startling facts.

One of its advantages is extreme lightness. While it weighs much less than aluminum, yet it possesses the peculiar characteristic that when a small quantity of it is added to copper, the latter acquires steel-like properties. It is said that a beryllium-copper file will cut through steel without throwing off sparks, thus being particularly adaptable for use around oil, gasoline, and other explosives.

New metal alloys containing this element will also find much use in the airplane industry, and anomalous as it may seem, the use of this new blessing to humanity will find its first applications limited by governmental regulations to bombing and fighting planes, the making of rifles, and other paraphernalia designed to blot out human life.

Probably after the world has finished with all of this unnecessary man-made trouble which sets nation against nation at present, beryllium will find its way into ordinary industrial uses, at which time the student in the school shop may have an opportunity to study and employ it.

Problems and Projects

A MODERN ASH TRAY

G. O. Wilber,
Oswego State Normal School,
Oswego, New York

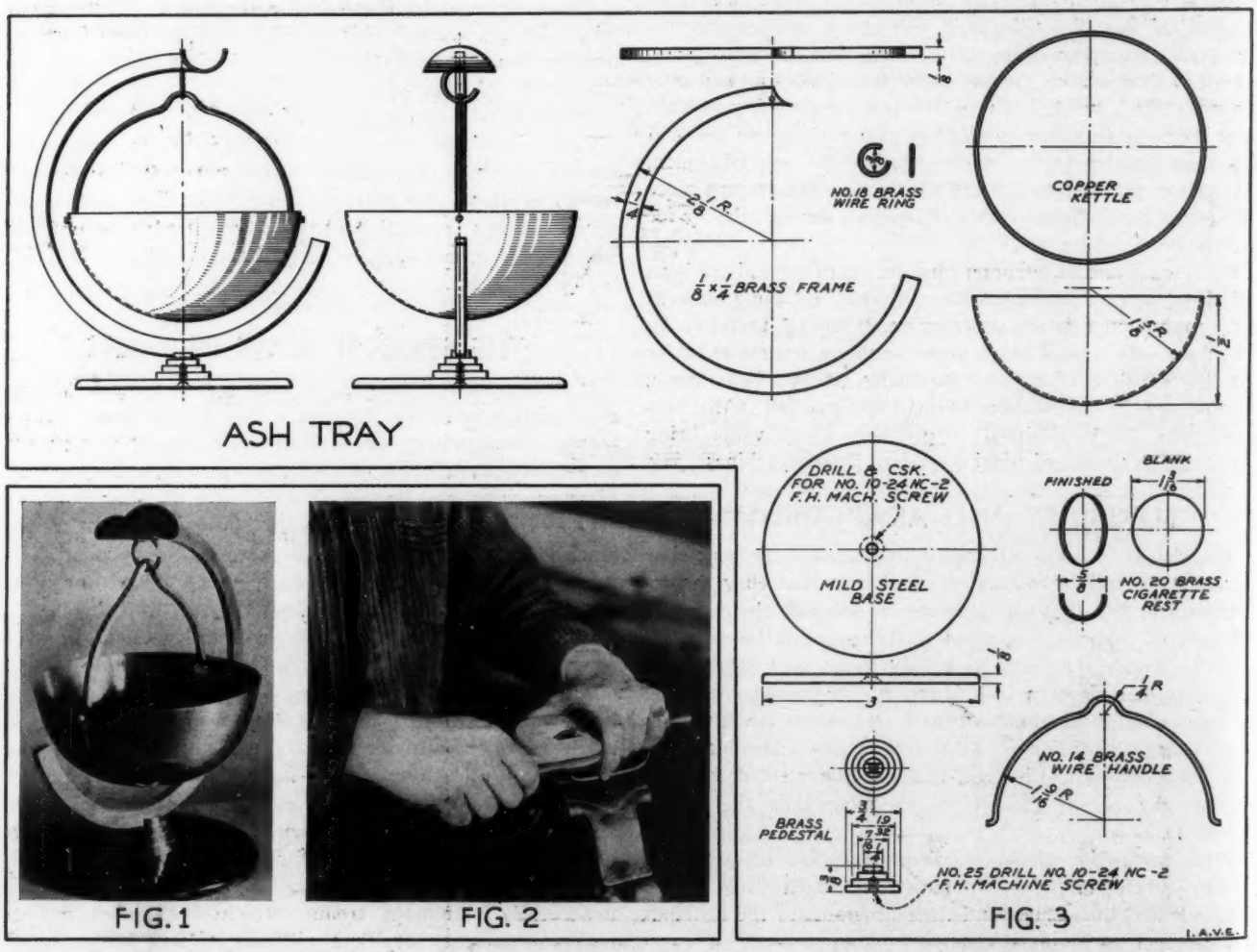
The ash tray shown in Figure 1, involves lathe turning, soldering, cold bending, and spinning or hand raising and planishing. Three different metals are used in the construction, thereby adding opportunities for exploration.

Base. The base of the tray shown in the accompanying illustration, is made of cold rolled steel. A piece of 3-in. round stock should be chucked and trued in the lathe. Face the end and take a cut on the outside just deep enough to true up. Turn the radius on the outer edge, after which the piece should be filed and polished. Drill a 13/64-in. hole at the center about ¼ in. deep and countersink for a 10 — 24 flathead machine screw. The base should be cut off to the correct thickness with a cut-off tool. This part also could be made of wood or bakelite.

Pedestal. This part should be made of free turning brass. Chuck a piece of the required diameter and turn to the shape shown. File and polish carefully, and then cut off to length. Rechuck or hold in a collet with the larger end out, and face the bottom. Drill and tap for a 10 — 24 machine screw thread. Tap while the piece is still in the lathe. The ⅛-in. slot to receive the frame may be filed, or it may be cut on the milling machine.

Frame. Flat drawn brass, ⅛ by ¼ in., is used for making this part. First prepare a jig for bending by sawing or turning a wood block ¾ in. thick and equal in diameter to the outside diameter of the frame. Around the outside of this turn a groove ⅛ in. wide and ¼ in. deep, and at the center of the block saw or bore a hole which will allow for clamping, as shown in Figure 2. Carefully anneal a strip of brass about 1 in. longer than the amount needed for the frame. The annealing is done by bringing the metal to a red heat, and then quenching quickly in water. Place the brass in the grooved jig, and clamp one end securely. See Figure 2. If the material has been properly annealed it may be bent into shape with the hands. If the end is difficult to form it may be drawn down with a hand clamp. The frame may be removed from the groove by lifting one end over the edge and turning. Trim to correct length, and drill the small hole at the top for the wire ring. Next shape the end to receive the cigarette rest with a jeweler's saw and files.

Kettle. The kettle or tray proper may be spun or hammered from 18-gauge soft copper. If it is spun the directions given in the April, 1935, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine, page 130, may be followed. If it is hammered, a depression the shape desired should be turned in a



The ash tray — Jig for bending the frame — Details of ash tray

block of hardwood, and the copper carefully hammered into it. During this process it will be necessary to anneal the metal several times to prevent cracking and wrinkling. After the tray has conformed to the shape of the block it should be placed over an iron or steel stake, and carefully planished with a highly polished hammer until all dents and irregularities are removed. Trim the top edge to the correct height, drill the holes for the handle, and polish and buff the entire surface.

Handle. The handle is made of No. 14 brass wire. Draw a full sized layout of this part, and from a piece of the wire slightly longer than needed, form the handle to shape, comparing frequently with the drawing. The sharp bends at the ends may be made by holding the wire in a vise, and bending with a mallet. Trim the ends to length and polish out all tool marks.

Cigarette rest. Cut a 1 3/16-in. circle from a piece of 20 gauge brass. After carefully polishing, bend into shape over a ½-in. rod or dowel.

Ring. The ring is made by wrapping a piece of 18-gauge brass wire around a ⅜-in. rod. Wrap two or three turns to make sure of a perfect ring; slip the wire from the rod and cut off to the length required.

Assembly. Be sure that all pieces are carefully cleaned and polished. Tin the end of the ring and slip into place in the frame. This should be a fairly tight fit. Tin the end of the frame where the cigarette holder is to be soldered; place the holder bottom up on the bench, and solder the frame in place with a small torch or copper. The heat from this operation should also sweat the ring solidly in place. Now tin the groove in the pedestal; place the frame in position, and using a small torch or copper sweat into place. If the base is made of steel or wood it should be enameled a glossy black before attaching to the pedestal. The bottom of the base should be covered with felt to prevent marring the table.

AERATOR FOR SMALL AQUARIUM

E. J. Orchard,

Providence, Rhode Island

An old toy steam engine of the upright or vertical boiler variety and a small electric motor such as is found in the later types of construction sets, are the principle parts needed to construct an aerator for the home aquarium.

The steam engine is cut in two just below the boiler, leaving enough of the shell of the firebox to provide a base and to insure against breaking the solder of the boiler, as shown in the drawing. The filler cap (8) is then removed, and the opening enlarged and rethreaded to admit a short length of copper tubing (7) as the air outlet. A section of automobile gas-line tubing and union may be used.

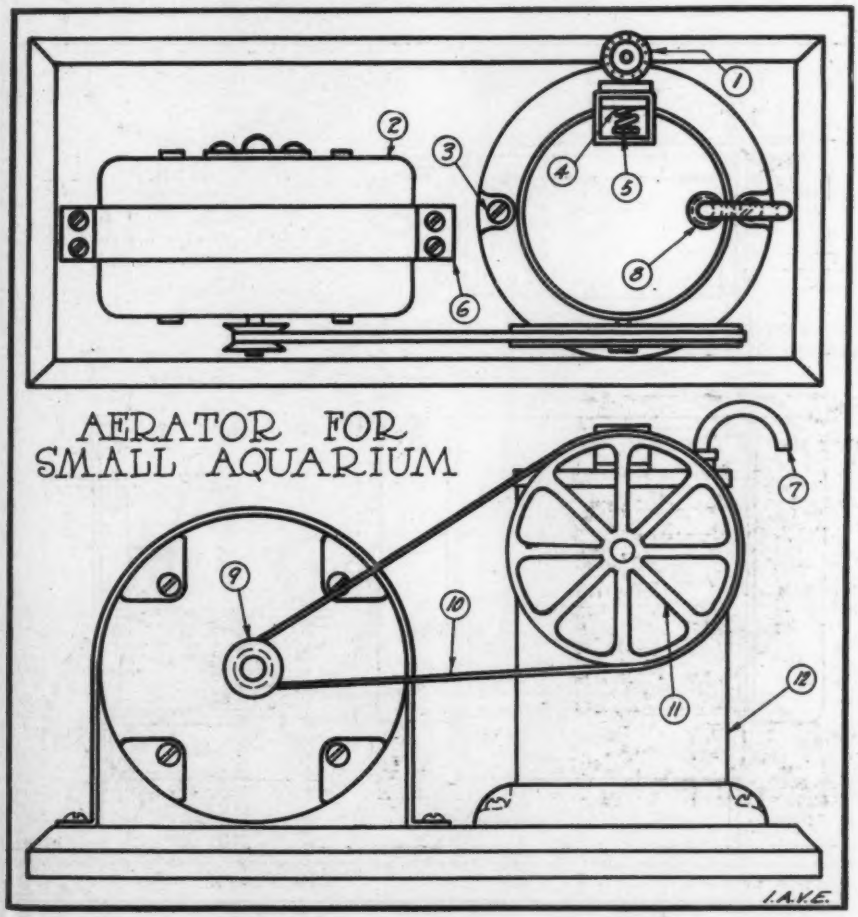
The electric motor used may be equipped with a base for mounting, but if it is not, a strip of brass or galvanized iron (6) is shaped and drilled for small, roundhead brass wood screws to secure it to the base.

The base may be shaped from any scrap wood available, and varnished or stained for natural finish or enameled in any shade to harmonize with the ultimate location of the unit. Align the motor pulley with the flywheel of the steam engine and secure both parts to the base. Apply a bit of light grease to the valve faces of the engine to insure against air leakage, but not enough to cause clogging of the ports. Tighten the tension spring (4) with nut (5) to a reasonable tension. A wide, flat rubber band will make an excellent driving belt.

The air line from compressor to aquarium may be a length of rubber tubing, the end of which is to provide a slight air surge may be lightly plugged with a bit of sponge.

A line resistance may be found necessary if the compressor unit is run too fast. Of course, if the motor used is of the 6-volt type requiring a transformer or batteries, instead of 110-volt a.c. input, the rheostat supplied with the motor or one salvaged from an old radio receiver or electric train set, will provide the speed control. A small toggle switch may be mounted on the base of the unit. Application of light oil to the bearings of the compressor, occasionally, will prevent excessive wear and assure ease of operation.

It must be remembered that the steam engine unit must be operated in a reverse direction from that in which it normally operates. This direction may be determined before the engine is altered, by screwing the filler cap on tightly, and turning the flywheel rapidly by hand in either direction. When the wheel has been turned in the reverse direction, air compressed in the tank will turn the wheel back a half-stroke or so when it is released. The motor direction (rotation) is then considered and the units mounted accordingly.



A BREAKFAST GONG

Mark E. Simon,

Township Centralized School,

Sullivan, Ohio

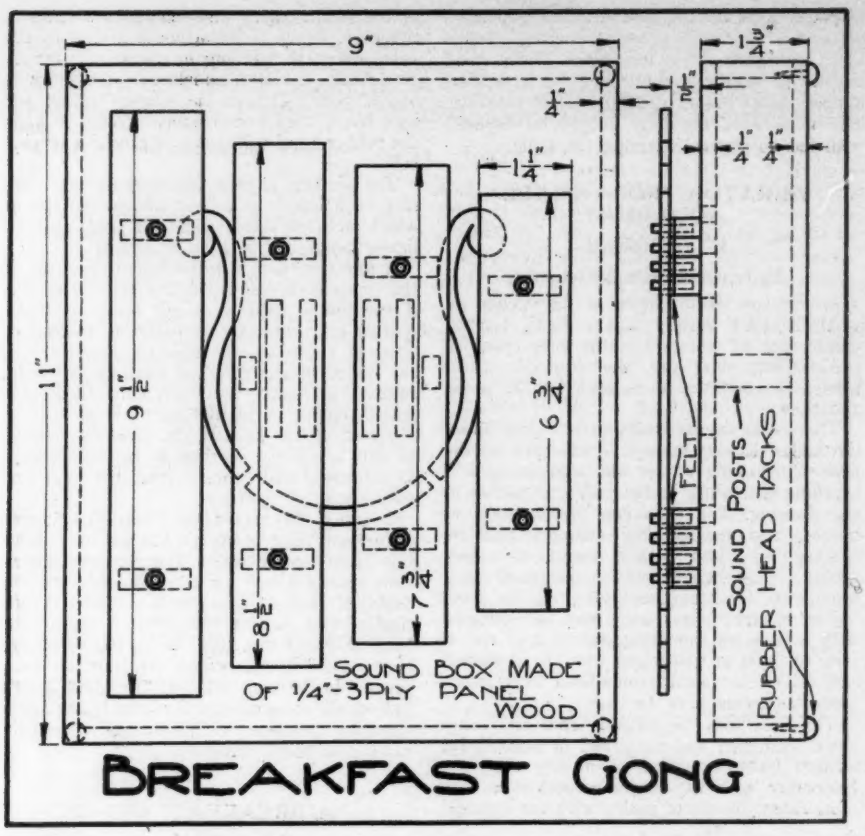
The breakfast gong described herewith is an interesting project which involves woodwork, metalwork, and finishing.

Bill of Materials

No. Required	*Size*	*Material*
2 pc.	9" x 11"	¼ in. 3-ply gum or mahogany
2 pc.	1¼" x 8½"	¼ in. 3-ply gum or mahogany panel wood (for ends)
2 pc.	1¼" x 11"	¼ in. 3-ply gum or mahogany (for sides)
2 pc.	⅜" x 1 5/16"	¼ in. 3-ply gum or mahogany (for sound blocks)
8 pc.	½" x 1"	¼ in. 3-ply gum or mahogany (for bar supports)
	½"	Brads
	⅜"	Rubber-tipped tacks
	1"	Copper rivets
	3/16" x 1¼"	Tire steel
		Felt

Set bar supports in center, each with a pin. Cut the bases from the 1-in. rivets and set into the ¼ by 1-in. face of the bar supports so that ¼ in. of the top of the rivet protrudes.

Assemble the sides and ends of the box using hot glue and brads, and immediately join the base to the frame in the same manner. While this is drying, sketch the lyre design on the piece of plywood which is to be used



for the top and cut out the openings. This design ought to be confined to a 5-in. circle, and the width of the cuts ought to be ¼ in. Any long cuts ought to be broken to give strength to the panel, for it must support the bars. Fasten the ends of the sound posts at the spots indicated with glue and brads. The sound posts are 1/32 in. longer than the depth of the sides, in order that a braced resonance sound box may be produced. The panel is then ready to be fastened to the frame. Place a little glue on the sound posts and then glue and brad the panel to the base, completing the resonance chamber.

With the hack saw, cut one bar 9½ in. long from the tire stock. A second should be 8½ in., a third, 7¾ in., and a fourth, 6¾ in. long. Then the fun starts. In a quiet room, support these pieces of iron on small blocks placed at distances similar to those occupied on the sound box, and tap them with a wooden stick till the pitch of each is determined. If not of the right interval, grind off the one which needs to be raised carefully until the correct pitch is obtained. The rule is that the shorter the bar the higher the pitch. When all of the bars have been corrected to the right pitch, they ought to correspond to C, E, G, and C of the major scale. Any other suitable combination may be selected.

When the true pitch is found, locate the dead spots near each end and bore 5/16-in. holes at these points for the supports. Check for need of retuning after the boring. Then color them to a pleasing blue by heating them evenly to a cherry red and cooling them slowly.

Now assemble the bars and their supports to the scroll surface, spacing them in a symmetrical manner. When a suitable arrangement has been obtained, mark the positions of the supports and then fasten them to the panel with glue. When firm and dry, small strips of felt are glued to the surface. This will keep the bars from the wood surface. The bars are simply laid on the supports.

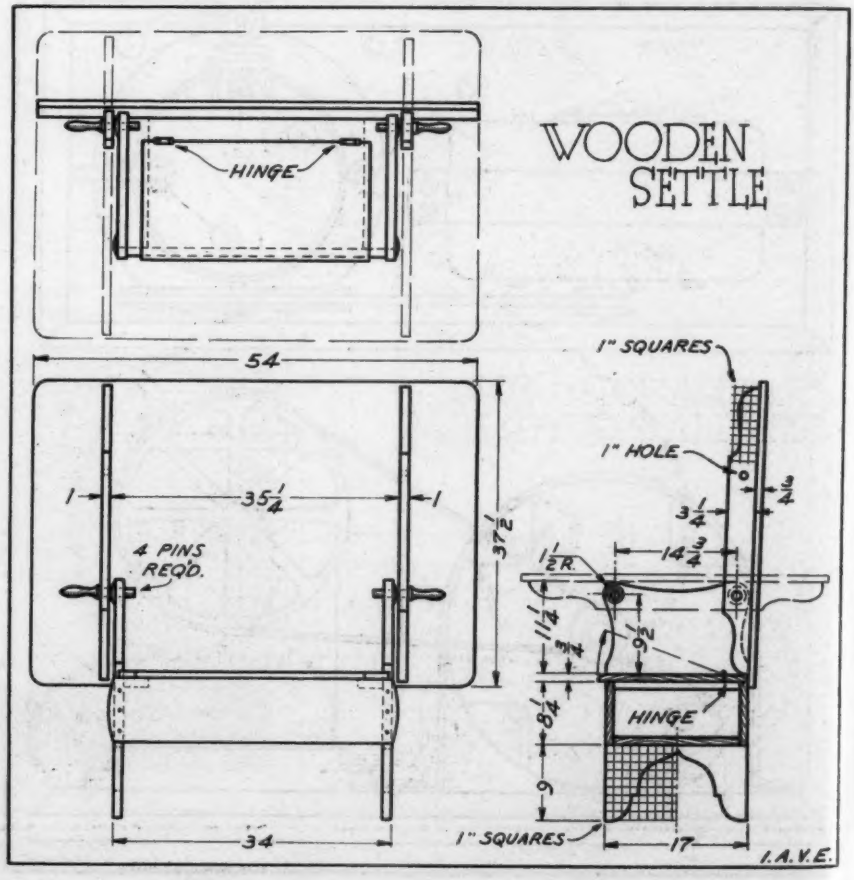
After careful sanding, the finish consists of the desired stain, a good wood-paste filler, then two coats of shellac. These applications will be steel wooled between coats, and after the last coat. A coat of wax completes the finish or a rubbed varnish finish can be used. The sound hammer is a turned walnut sphere ¾ in. in diameter set on an 8-in. round semi-flexible handle. It is finished like the gong. Fasten small rubber-tipped tacks in four corners of the base.

WOODEN SETTLE

J. E. Ray,
The Stout Institute,
Menomonie, Wisconsin

This piece of cabinet work was used quite extensively during the early Colonial period. It was designed to serve the double service of a seat and a table. The author saw such a settle at Middletown, Pa. It was made of pine and was used daily by an old Quaker family. The pins, which are used to hold the top in the desired place on this old settle, had been whittled by hand.

This piece was crudely constructed, the joints were nailed, and it would seem out of place to make one at this time with extra fine cabinet work, and thus lose the character of this fine old piece. It would be wise, however, to have it sanded and finished smoothly.



with orange shellac if it is made of pine.

The drawer with the hinged lid makes an ideal place to store odds and ends.

The old Colonial pieces were very practical, and this table would fit in well with furniture of the early American period. It was used in the dining room.

It is advisable to have the craftsman stick closely to the original dimensions such as 1 in., instead of 13/16 in. This will require 5/4 stock instead of 4/4 stock. The curves are made freehand, and the cross piece should have rounded ends.

A SMALL WROUGHT-IRON LAMP

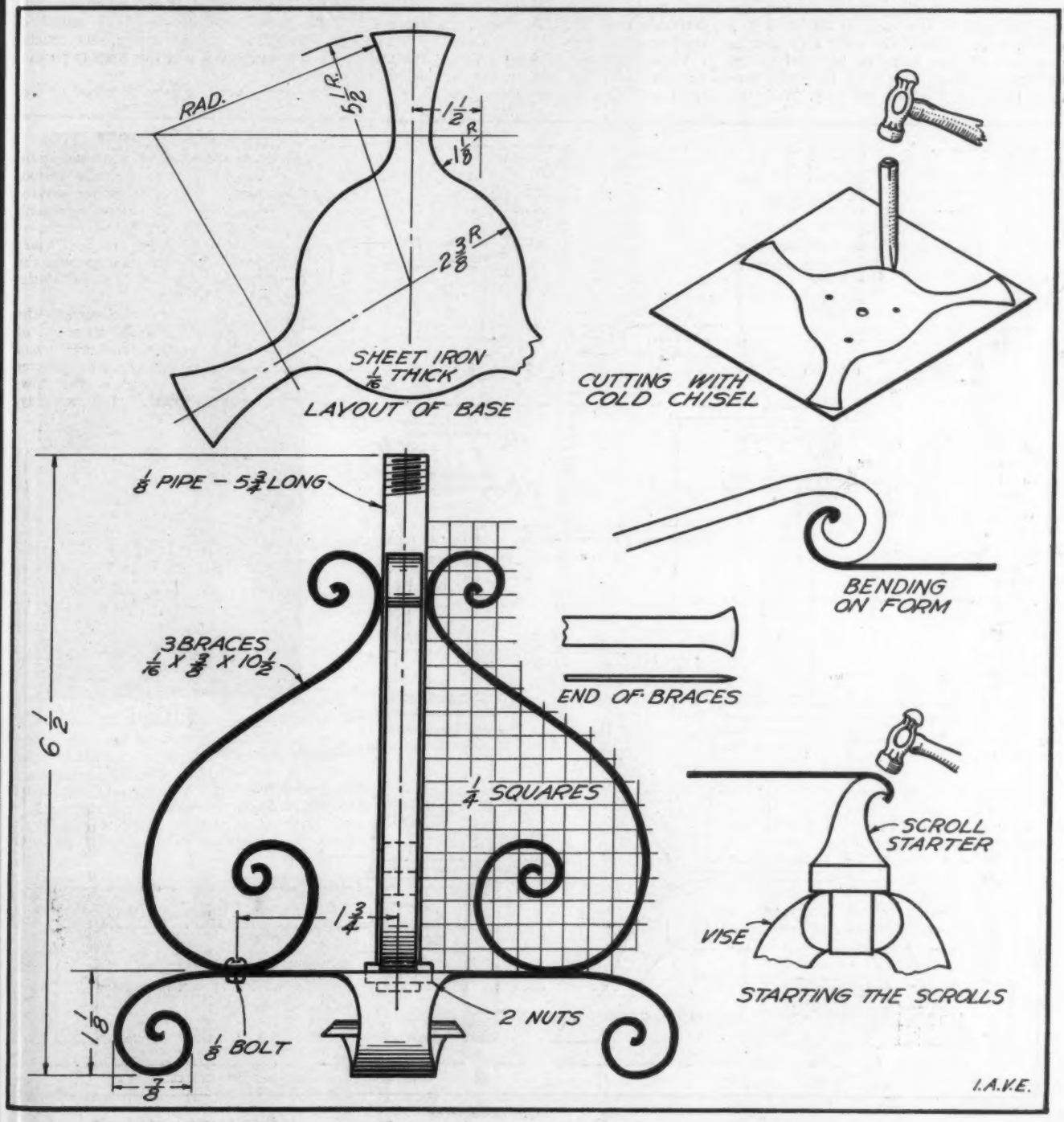
Roy M. Spaulding,
Jefferson School,
Fort Wayne, Indiana

The wrought-iron lamp described herewith was devised to give the beginner a well-designed project on which he can learn a large variety of tool processes.

A full-size pattern should be made and the pieces bent to fit it. The two simple scroll forms also may be used if such are available. These give assurance of more uniform results.

The base is first laid out, either on paper or directly on the metal, and cut out as shown. The cutting is done with a cold chisel and an iron block or anvil. The edges are then filed smooth, the holes laid out and drilled, and then the scrolls for the feet are bent. These may be started on the scroll starter and finished on the form.

The next step is to cut three pieces for the scrolls. The ends should be shaped as shown, after which the scrolls may be formed as were those on the base. It should be noted



Small wrought iron lamp

also that the two are to be scrolled in opposite directions. The small end is bent on the same form as the feet, and the other on a larger form.

The standard is a piece of ⅛-in. pipe, threaded on both ends and secured to the base with two nuts as illustrated. The scrolls are drilled and fastened with ⅛-in. roundhead stove bolts or rivets may be used. If they do not touch the standard they must be bent so that they do touch.

The entire piece is then thoroughly cleaned. The finish may be dull black lacquer, used alone, or it may be high lighted with gold. Green, orchid, or other colored lacquer also may be used if the lamp is to fit into a certain color scheme. The lamp may also be planished all over with the ball end of the ball-peen hammer. This must be done, however, before any scrolls are bent. With this type of finish, the metal is to be high lighted with emery cloth.

A socket is then screwed to the top end of the standard and the lamp wired. A shade of the type that clamps on the bulb is recommended for this lamp.

COLONIAL ANDIRONS

Roland R. Hintz,
New Rochelle, New York

Projects that are useful, artistic, and interesting will always appeal to the craftsman. The Colonial andirons shown in Figures 1 and 2 are excellent projects which involve patternmaking, drafting, foundry work, and machine-shop work.

These andirons require three patterns and one core box. The top or urn section lends itself well to a simple split pattern.

The middle section should be cored to cut the weight of the andirons. A simple cylinder core may be used.

Probably the most difficult pattern to make is the one of the legs. However, a one-piece pattern will suffice for this part, because the front of the legs are flat. The castings may be made of bronze or brass.

The parts are small, so that enough metal can be melted for each part in a large sized crucible on a deep forge fire.

The urn or top may be chucked in a universal chuck and cleaned up carefully with a file and emery cloth. The bottom of the urn section can be milled off or filed square.

The middle section should be milled off top and bottom as the first step, then chucked in a four-jaw chuck and the circular portions machined.

The square portions may be milled or filed.

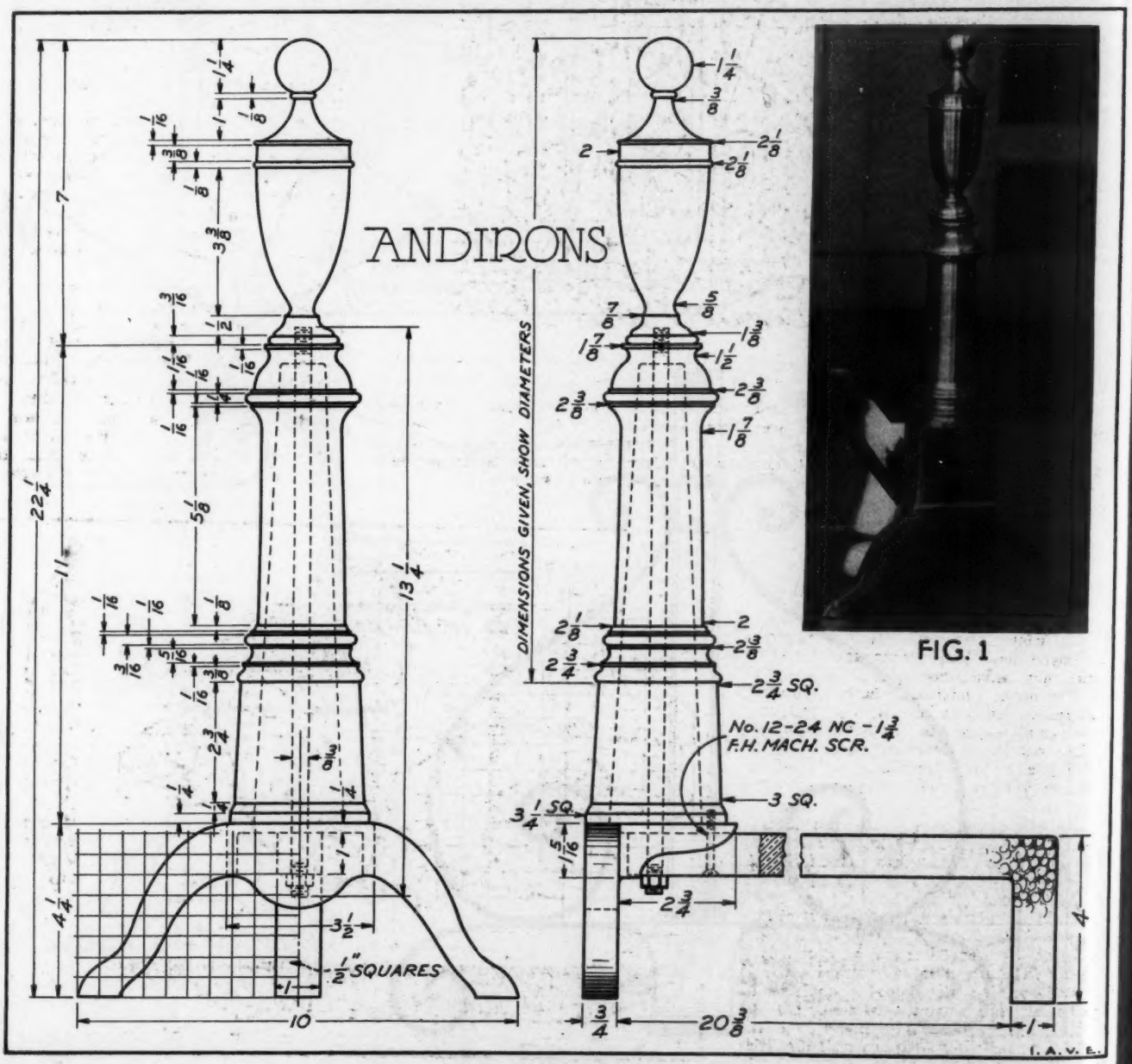


FIG. 1

Fig. 3. Details of andirons

The base or legs can be best handled by milling or shaping the front and top, and hand finishing the balance.

All parts must be highly polished to give the desired effect when the andiron is assembled. This may be done with a polishing wheel and rouge on a high-speed grinder.

Fig. 2

The back is composed of 1-in. square mild steel, bent over and peened heavily all over.

The andiron is assembled with a long bolt, as shown. This, together with one machine screw hold the leg rest, the middle section, and the leg together.

CARVED FRUIT DISH

Bruce MacIntosh,

Braintree, Massachusetts

The richly carved design shown in Figure 1, has come down from grandmother's time to grace our present-day life. Modern power tools reduce to a minimum what was formerly an arduous task with hand tools. In fact, two evenings are ample time to finish this project.

Lay out the pattern on paper as shown in Figure 2. Then transfer it to a ⅞ by 5¾ by 9-in. piece of whitewood or other stock. Next, saw out the pattern and do the boring where possible to cut down the labor of carving. A spurless bit set to a depth stop may be used for this. The slanted under edge of the dish is made with jigsaw table tilted. The rough hollowing is then refined with gouges and chisels, and the fine pattern lines traced in and carved. A good average wall thickness is 5/16 to ⅜ in.

Fine sandpaper gives the whole a smooth finish, ready for oil stain which is finally rubbed down with a wax.

Fig. 1. Carved fruit dish

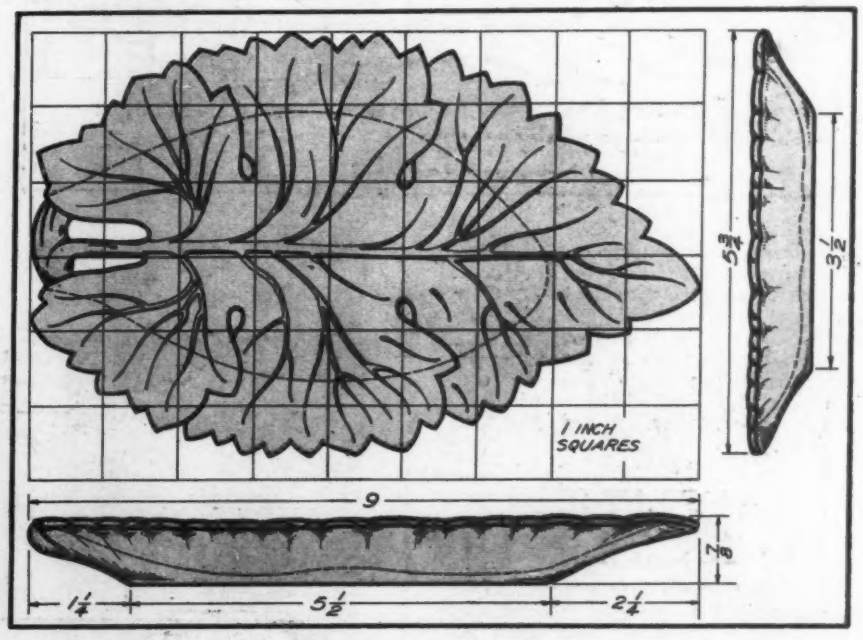


Fig. 2. Layout of fruit dish

BUD VASE

Harold O. Akeson,

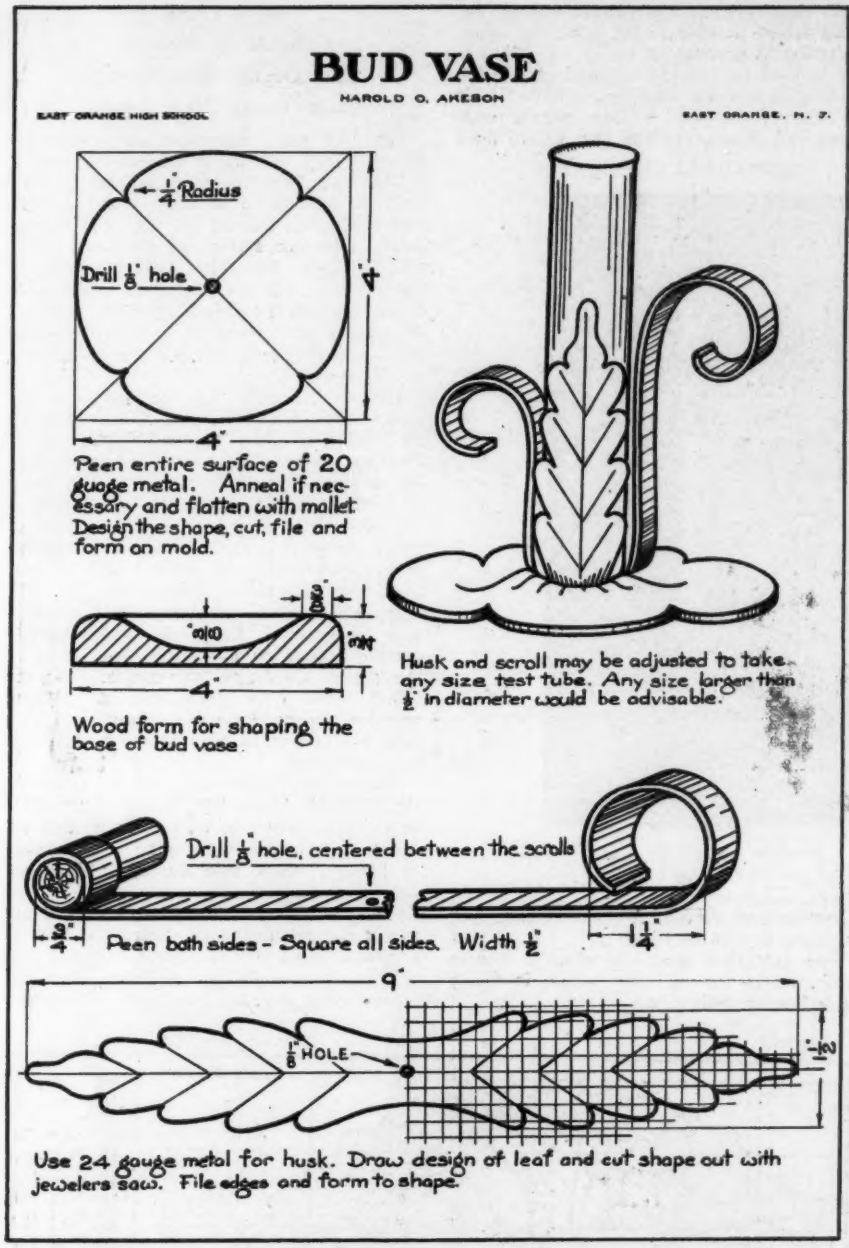
East Orange High School,

East Orange, New Jersey

The bud vase, illustrated and described herewith, may be made of either iron, copper, or aluminum. For the base, lay out a 4-in. circle on a piece of 20-gauge metal, of the chosen material. Cut out the disk with tinners shears. Peen one surface of the metal circle with a 12-oz. ball-peen hammer. Using a jewelers saw, cut out the four scallops as shown, and file the edges smoothly, rubbing them down with emery cloth. Form to shape with a small fiber mallet. Drill a ⅛-in. hole for the rivets.

The scroll handles for the bud vase are made of one piece of metal, measuring 1/16 by ½ by 16 in. Cut to size with tinners shears. Peen both sides with the peening hammer having the metal lay on the end grain of a piece of hard maple. If a piece of hard maple is not available, do the peening with the metal laying on an iron surface, but place blotting paper between the iron surface and the material when hammering. Square the edges with a smooth file and rub each edge thoroughly with emery cloth. Shape the scrolls with a bending jig or on a suitable sized pipe, to the desired curves of the scrolls. Find the center, between the scrolls, and drill a ⅛-in. hole for riveting. From the center, bend both sides over a 1-in. maple block to take a 1 by 8-in. test tube.

Twenty-four gauge metal is used for making the husk. Trace the pattern of the husk on the selected piece, with a scriber and cut out very carefully with small jewelers saw or tinners shears. File the edges smoothly, keeping them uniform. A cold chisel is used to make the veins. Care must be taken not to cut through the metal. Shape the husk in a hollow block form. Find the center and drill a ⅛-in. hole for riveting. Bend the finished piece over the 1-in. block of maple as


BUD VASE
HAROLD O. AKESON
EAST ORANGE HIGH SCHOOL
EAST ORANGE, N. J.
¼" Radius
Drill ⅛" hole
4"
Peen entire surface of 20 gauge metal. Anneal if necessary and flatten with mallet. Design the shape, cut, file and form on mold.
4"
Wood form for shaping the base of bud vase.
Husk and scroll may be adjusted to take any size test tube. Any size larger than ½" in diameter would be advisable.
Drill ⅛" hole, centered between the scrolls
¾"
Peen both sides - Square all sides. Width ½"
1¼"
9"
⅛" HOLE
Use 24 gauge metal for husk. Draw design of leaf and cut shape out with jewelers saw. File edges and form to shape.

was done with the scroll handles, making the holder for the test tube.

The parts are then ready for assembling. The husk is placed between the base and the scroll handles. Rivet all the pieces together securely with a ⅜ by ¼-in. rivet.

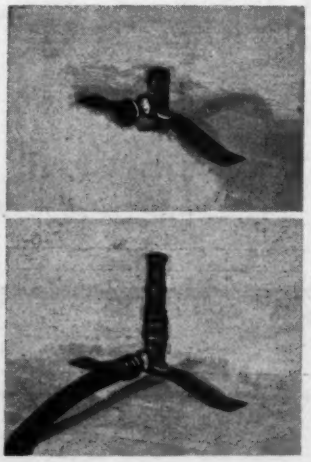
After assembling, rub all surfaces evenly with fine emery paper and 00 steel wool, then clean parts with a soft cloth, removing particles of steel-wool dust, and apply two coats of lacquer.

A LAWN SPRAY

Rex Aton,

Minot, North Dakota

The project shown in the accompanying illustration is for converting the ordinary spray nozzle of the garden hose into a stationary vertical spray. Its simple structure makes its construction very easy.



Bill of Materials

No. Required	*Size*	*Name of Part*
1	⅛" x 1½" x 12"	Strap iron
2	¼" x ½"	F.h. stove bolts
1	⅝"	Brass hose coupling (male and female members)
1	½"	Galvanized malleable iron drop elbow

Each member of the hose coupling is inserted into the drop elbow and soldered into position as shown. The base is drilled and tapped to receive the stove bolts for attaching the drop elbow.

The design for the base presented in this illustration is only a suggestion, and may be changed to suit the wishes of the craftsman.

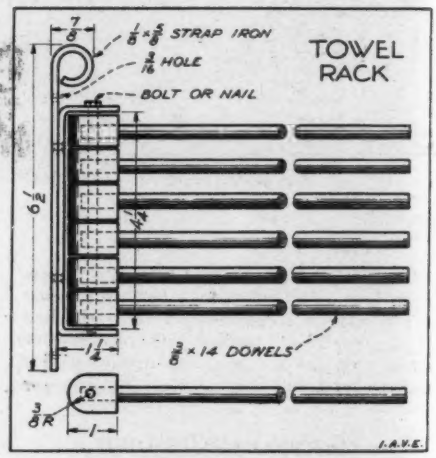
TOWEL RACK

J. R. Hankison,

Junior High School,

Logan, Ohio

The towel rack, shown herewith, combines ⅛ by ⅝-in. strap iron and woodwork. The design may be varied and the number of racks changed.



BOOTS, THE AIREDALE

Chris N. Scott,

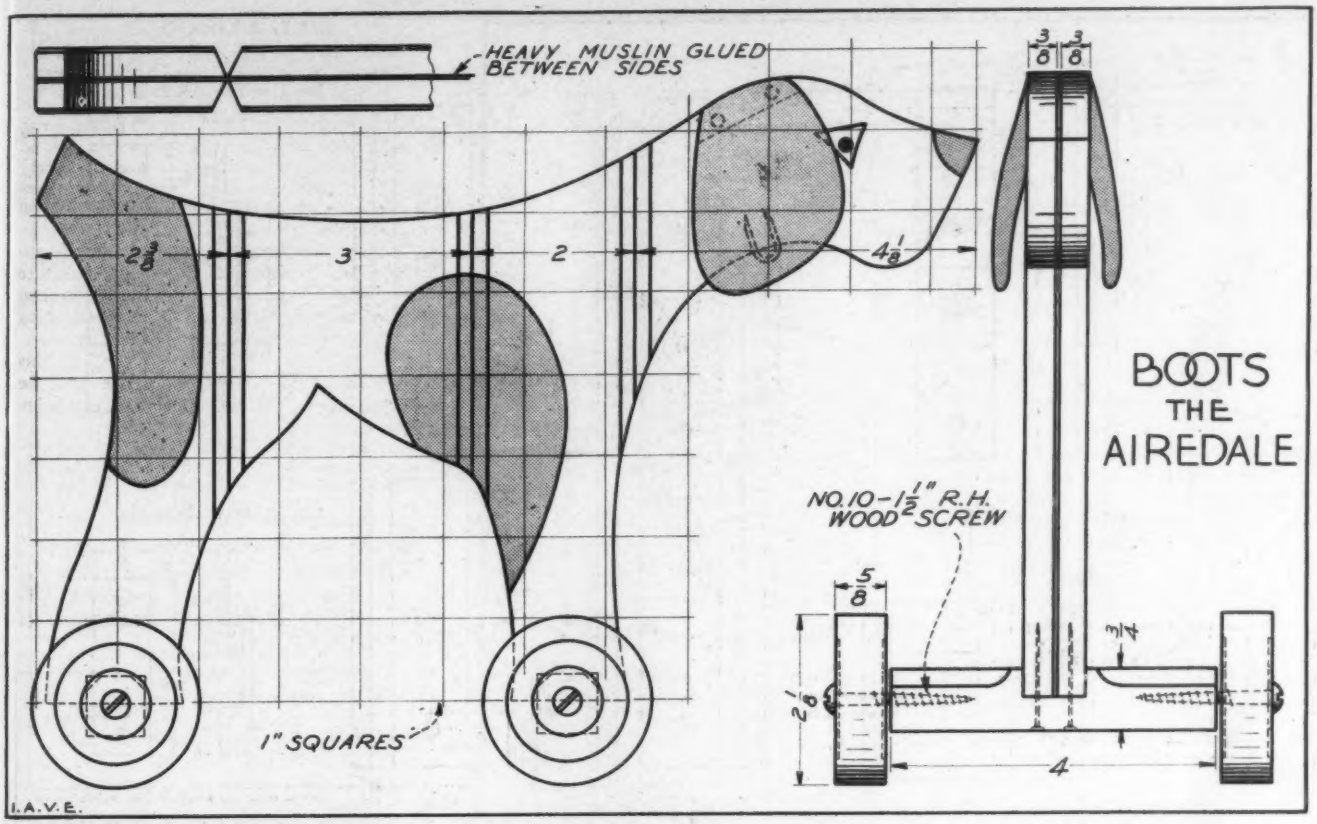
Creston, Iowa

This project arouses great interest because of its novel construction. It also is greatly appreciated by the small brother or sister who gets it.

The construction of this toy is such that even the poorest craftsman will be able to make a fairly presentable job. The project calls for a variety of tool operations, such as turning the wheels, planing bevels on the pieces at the joints, sawing out the outlines with jig saw or coping saw, and fitting the body to the axles.

The novelty in the construction of this job lies in the method of making the flexible joints. The pieces for the body are first beveled at the joints and then glued on each side of a heavy piece of muslin. The pieces are securely nailed to clamp the pieces together until the glue sets. When the glue is dry the outline of the dog is traced on the pieces, which are then cut out on the jig saw. The joint is very strong and flexible.

For the construction of the toy the following material is needed:



Bill of Materials

No. Required	Size	Material	Name of Part
2 pc.	3/8" x 2" x 7"	Basswood,	Hind quarters
2 pc.	3/8" x 3" x 4"	Basswood,	Center section
2 pc.	3/8" x 2½" x 7"	Basswood,	Front quarters
2 pc.	3/8" x 4½" x 4½"	Basswood,	Head
2 pc.	13/16" x 1" x 4"	Basswood,	Axles
4 pc.	5/8" x 2¼" x 2¼"	Basswood,	Wheels
1 pc.	7" x 8"	Muslin	

The wheels are best turned on a screw plate. The wheels can be held to the plate with a 3/16-in. stove bolt through the center of the plate and the wheel. If a lathe is not available very satisfactory wheels can be cut out with a coping saw. It is also quite easy to rig up a ¼ h.p. motor for use as a faceplate lathe. In this case sharpened files make very good tools. The axles are notched or gained to fit the feet after the dog has been cut out. The stop chamfers introduce additional tool operations, as well as adding to the finished appearance of the project. The ears are made from scraps of upholstering leather, or may be cut from old shoes.

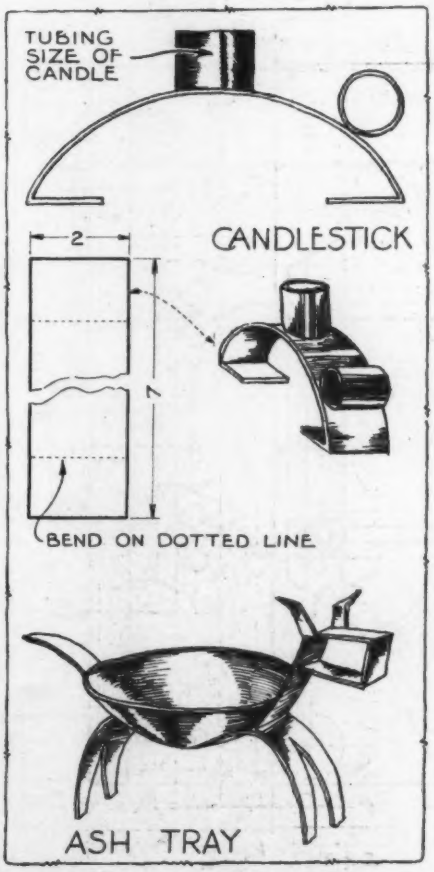
Any color combination may be used for the finish. Two coats of quick drying white enamel with black nose and spots, green axles and red wheels give a good combination. Better results with the enamel can be secured if the job is shellacked and then thoroughly sanded before the first coat of enamel is applied.

CANDLESTICK AND ASH TRAY

Kenneth R. Kuemmerlein,
Ladysmith, Wisconsin

The candlestick and the ash tray, shown herewith, may be made of 20-gauge copper, brass, or pewter. Tools necessary are tin shears, wooden mallet, sandbag, or scooped-out block of hardwood and soldering equipment.

Finish metalwork with steel wool. Tubing for candle can be made by hand or bought to size.



FRAME CLAMP

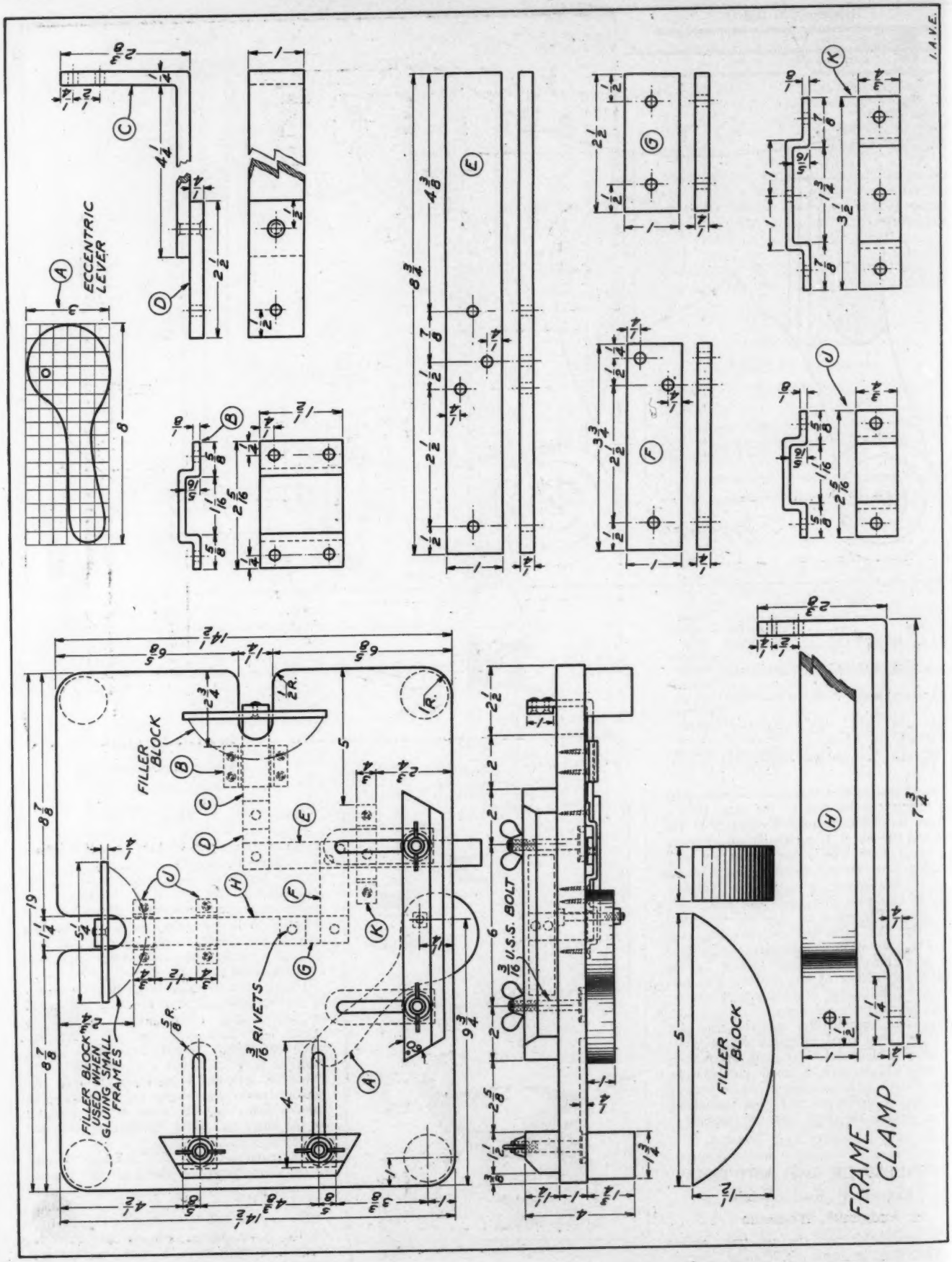
Arthur K. Stinson,
High School,
St. Louis, Michigan

It is often difficult to glue miter joints in frame construction, the butt or rabbet joints of a minature chest, or other joints of a project requiring uniform pressure on all four sides at the same time. Therefore, this easily constructed, inexpensive clamp has been designed to be generally useful as a holding device when gluing. It has power in clamping, simplicity in operation, and assures squareness of the finished project.

The clamp mechanism is mounted on a 14½ by 19-in. plywood base which is shellacked to prevent glue from adhering to it. The ¼ by 1-in. strap iron jaws and levers are bent cold, drilled, riveted, and bolted in the positions shown. The oak lever eccentric easily closes the jaws and holds them firmly at any position under any degree of pressure. The wooden jaws may be bolted at any position on the board to take in the varying sizes and shapes of shop projects.

Inking parallel lines ½ in. apart on the face of the clamp base just ahead of each wooden jaw aids in speedy, accurate adjustment without the use of a try square or straightedge.

The capacity of this clamp is limited to a 12 by 17 in. frame, but the principle described herewith may be used on any sized board to clamp projects of any size.



Submitted by Arthur K. Stinson, St. Louis, Michigan

BROOM HOLDER

Frederick Neuschel, Jr.,
Buffalo, New York

Although the principle of the broom holder is not a new one, it has been redesigned to make it more attractive. Its attractiveness, however, has not detracted from its usefulness. When painted to fit into the color scheme of the room, it will become a useful device, appreciated by any homemaker.

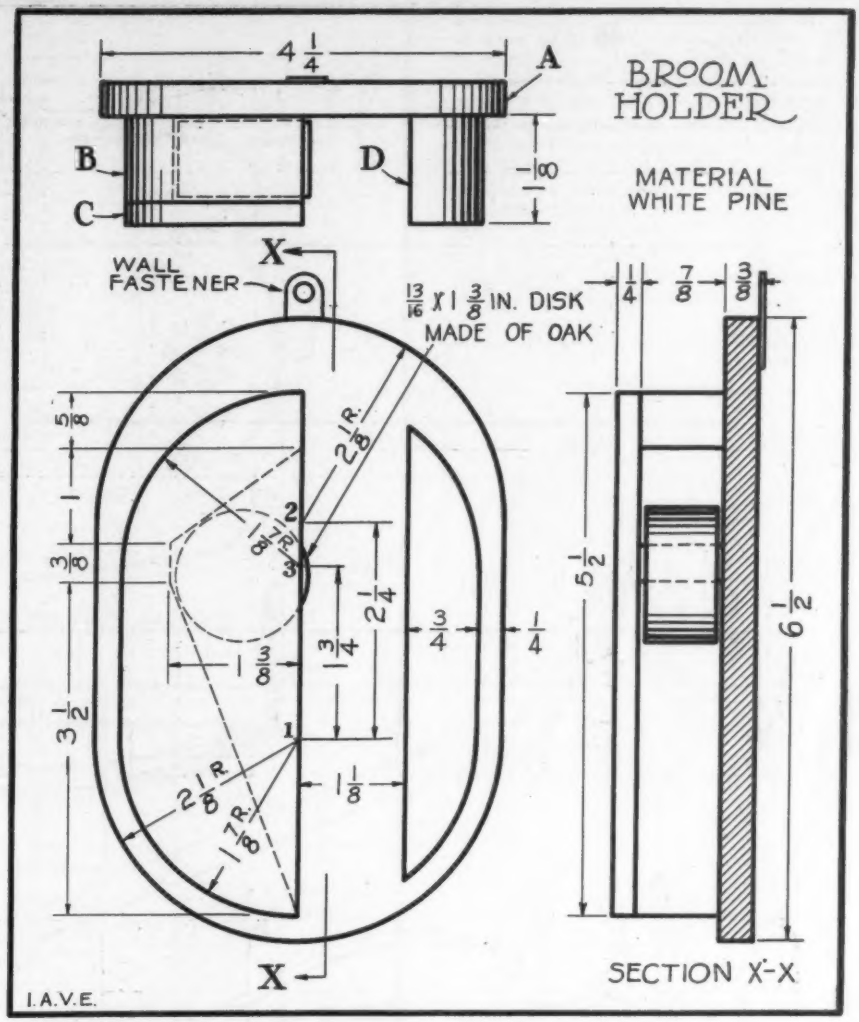
This project is easily made, if the working drawing is carefully followed. Each piece has been lettered as an aid in getting out the stock and assembling the pieces.

Bill of Materials

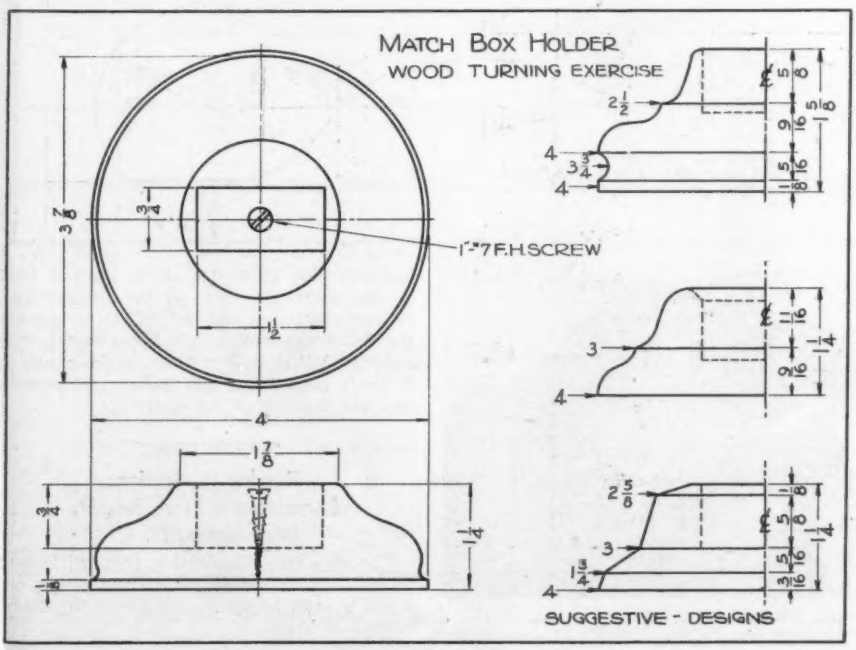
No. Required	*Size*	*Material*
1 pc.	⅜" x 4¼" x 6½"	*A* — rough stock
1 pc.	⅞" x 1⅜" x 5½"	*B* — rough stock
1 pc.	1¼" x 1" x 5¼"	*C* — rough stock
1 pc.	¼" x 2" x 5½"	*D* — rough stock

Method of Procedure

1. Lay out pieces *A*, *B*, *C*, and *D*.
2. Lay out the location of pieces *B* and *D* on piece *A*.
3. Cut all pieces on the jig saw.
4. Finish each piece by sanding. Do not sand off the layout made on piece *A*. Be sure that the V cut made to accommodate the disk is smooth and at right angles to the sides of the piece.
5. Cut the wooden disk from a 13/16-in. piece of oak, or other hardwood. The disk must be perfectly circular in shape.
6. Glue and brad the pieces *B* and *D* to the back *A*. Use the layout lines as guides for placing each piece.
7. Remove the excess glue with a chisel and damp cloth.
8. Insert the wooden disk.
9. Glue and brad piece *C* onto piece *B*. Be sure that no brads project into the space provided for the disk.
10. Set all brads showing.
11. Remove all excess glue.
12. Sand with fine sandpaper.
13. Make a small metal plate with which to hang the broom holder onto the wall.



14. Fasten the plate to the back of the holder.
15. Fill all brad holes.
16. Shellac.
17. Sand lightly.
18. Enamel or lacquer.



TURNED MATCHBOX HOLDER

Edward F. Ferguson,
Lincoln High School,
Ferndale, Michigan

This matchbox holder presents an interesting novelty in which the beginner may learn the fundamental processes of faceplate turning. One of the designs shown may be chosen, or the craftsman may make his own design.

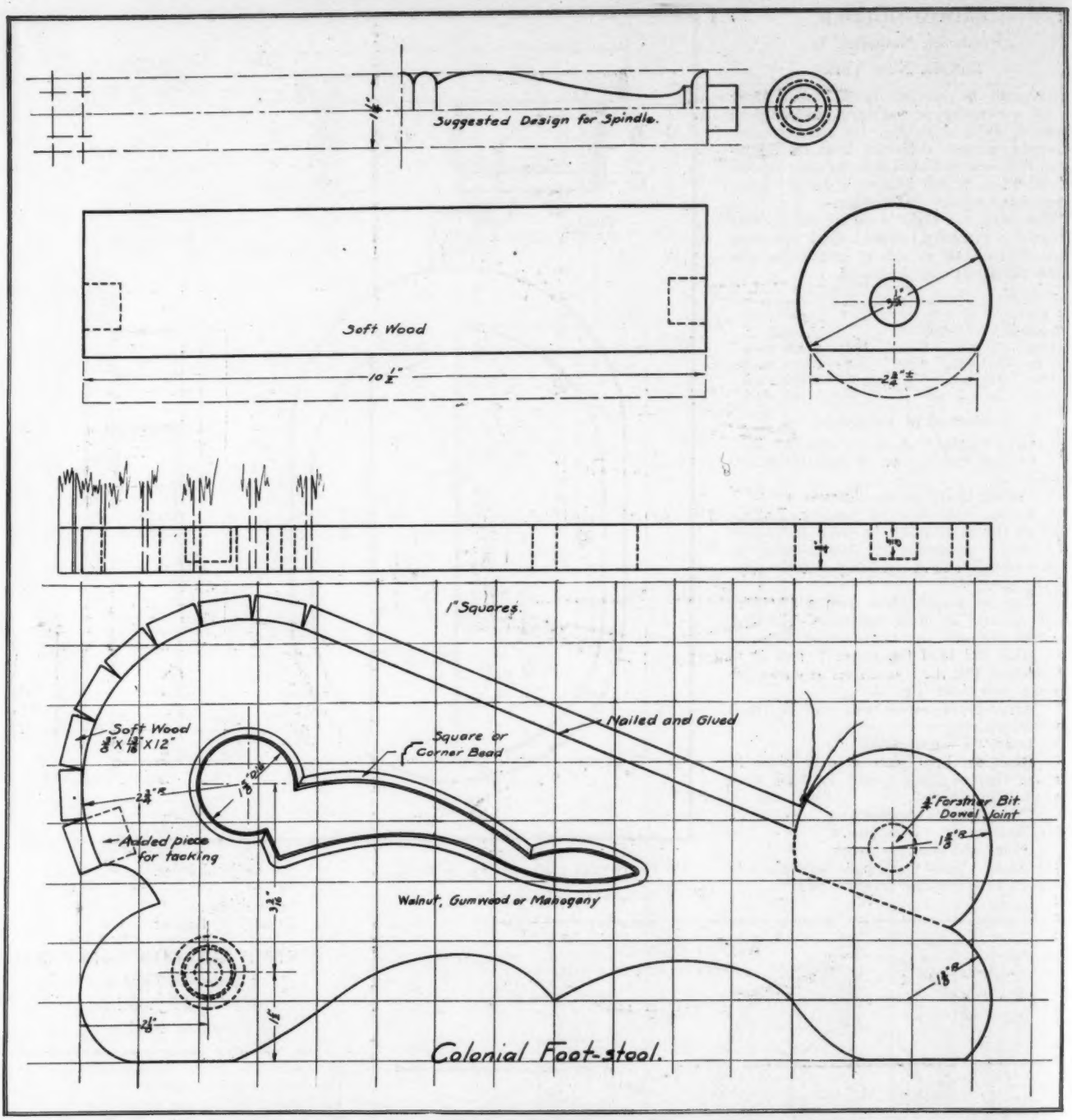
The rough stock should be 1⅜ by 1⅜ by 4½ in., dressed on one surface. The hole may be chiseled out to the dimensions given, or it may be made to fit the kind of matchbox that is to be used.

The matchbox will automatically open when placed over the screw and forced down in the groove. Any suitable finish may be chosen for this project.

COLONIAL FOOTSTOOL

Walter J. Whitmus,
Walker Junior High School,
Milwaukee, Wisconsin

This particular footstool design was taken from an old family antique. It is not an exact reproduction but it still retains the original



design. Students find it very interesting, and not too difficult, although its construction requires considerable skill and patience. A glance at the working drawing will give an idea as to the variety of jobs involved. Wood carving also might be added. The dimensions may be varied but those shown have proved very convenient.

Discontinued samples of upholstering materials may be used. They cut to a convenient size (16 by 27 in.) and the loss in material is more than made up in the economy of purchasing from the neighborhood upholstery shop. The padding used is the medium cotton felt and may be put on either single or double, depending upon the fullness desired.

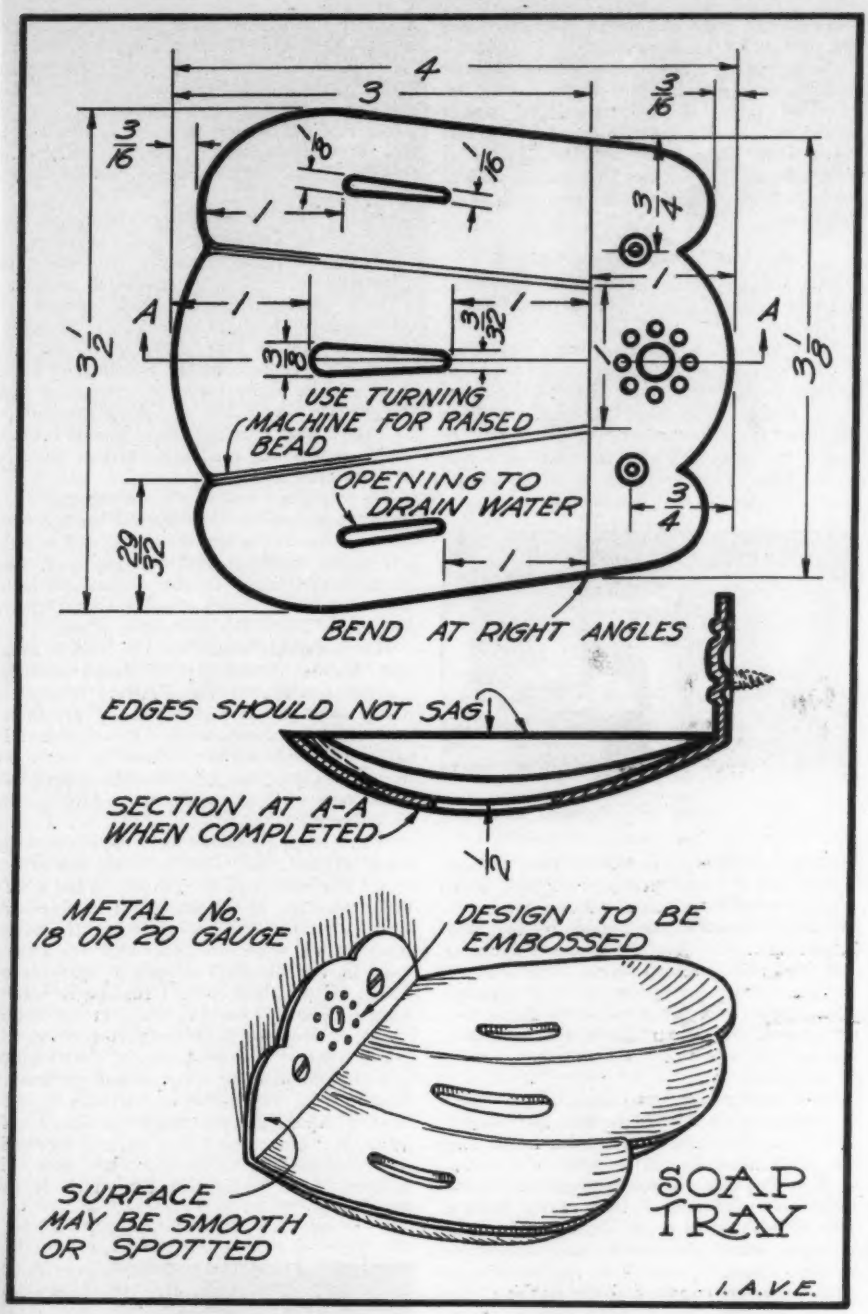
When tacking the material preparatory to padding, allow about 8½ in. for the roll. Fold at this point and tack on the reverse side, as near the bottom of the roll as is possible and space the nails about ½ in. apart. The padding is then laid in place, making sure it is firmly tucked into the corner, and proceed with the drawing of the material.

Colonial footstool

SOAP TRAY

Wesley B. Speller,
Shaw Junior High School,
Washington, D. C.

The soap tray described in this article may be made of 18- or 20-gauge sheet metal, but it will be more attractive if made of aluminum, copper, or brass.



Material

Aluminum, copper, or brass, 18 or 20 gauge, No. 0 steel wool, powdered pumice, clear lacquer.

Tools

Ball-peen hammer, jewelers saw and blade, hand drill, 6-in. round file, and hand groover or turning machine.

Method of Procedure

1. Lay out paper pattern from working drawing.
2. Glue pattern to metal.
3. Cut out blank with jewelers saw.
4. Spot back with spotting hammer or ball-peen hammer.
5. Center punch and drill holes at the ends of the drain holes.
6. Saw out metal for the drain holes with No. 2 or No. 3 blades.
7. Smooth edges with the file.
8. Raise bowl section ¼ in. with raising hammer or ball-peen hammer.
9. Use turning machine or tool for raised beads.
10. Brake back AA at right angle to bowl of soap tray, using either a cornice brake or a square stake.
11. Polish with No. 0 steel wool and pumice and cover with clear lacquer.

DON'T USE KNOCKDOWN CONSTRUCTION ON HOME FURNITURE

J. I. Sowers,
Miami, Florida

Most of the furniture we see has been *shipped* to the point of sale, and as a consequence, to cheapen freight, and for convenience in packing, knockdown (or K.D.) construction is used. Frequently amateurs, and even some local woodworkers, having seen so much of this type of construction, forget that it is not the best type of construction, and is used only to facilitate shipping.

In joining the rails to the legs of a table, for instance, knockdown construction makes use of a table leg corner brace and bolt. Samples of these are shown at *A* and *B* in Figure 1. Such construction is far less desirable than the mortise and tenon, shown at *C*, which is much to be prefered.

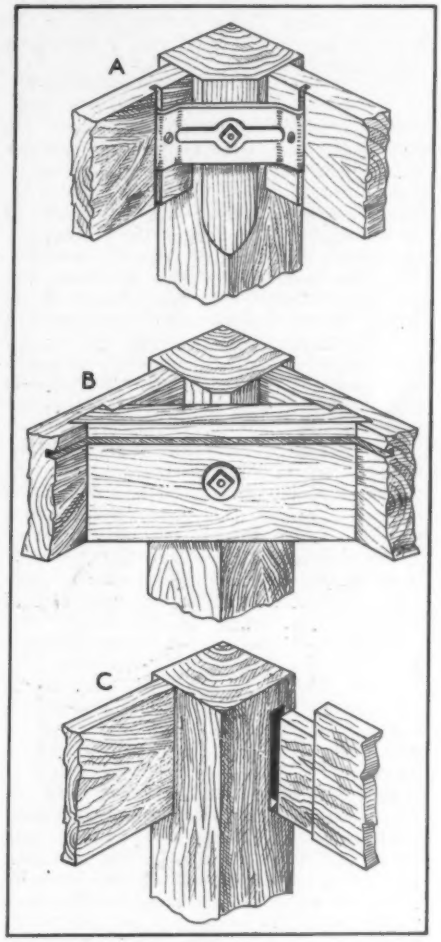


Fig. 1

The writer has found many amateurs in local home shops using K.D. methods of construction, when sounder methods of joinery would serve better. When furniture is made by the craftsman, neither time, nor money is saved by use of K.D. construction.

An instance that came to the writer's attention was that of a large department store that had ordered a quantity of fine mahogany tables made locally. These were made with mortise and tenon construction, and in the best manner. However, the manager, accustomed to buying K.D. tables from a distant point, refused to pay for them on the ground that they were not properly made. The shop sent a man to attach the fixture shown at *A*, Figure 1, and though it served no useful purpose, the bill was promptly O.K.'d for payment.

GEM CUTTING AND JEWELRY MAKING

William T. Baxter,

Woodrow Wilson High School,

Washington, D. C.

When Woodrow Wilson High School was opened in 1935, the art metal shop was equipped in the usual manner with simple jewelry-making tools and benches where hard soldering could be done.

The first semester was devoted to the usual art metal projects, although a few students preferred to work with silver and semiprecious stones. Today the majority of the students, by choice, work with semiprecious gem stones and silver.

Gem Cutting

Gem cutting was introduced because the author, who has charge of the shop, together with several boys, became interested in the possibilities of cutting cabochons from semiprecious gem material. Visits were made to the gem-cutting laboratory of the Smithsonian Institution and there it was learned that cabochons could be cut either upon cast iron laps using silicon carbide grit, or upon silicon carbide wheels. Two lap wheels were installed and by using silicon carbide grit as an abrasive, cabochons of a very good quality were produced in a short time. The method was slow, however, as lap wheels must revolve relatively slowly.

Two silicon carbide wheels were, therefore, mounted on an improvised arbor and used for experimental tinkering after school hours for several months. This method worked much better and soon students were begging to be allowed to stay after school and try their hand at gem-stone cutting. Numerous problems were encountered, among them that of bumpy wheels, which we later learned was due to the fact that we were using too low a speed.

Going from the improvised setup to an arbor where faster cutting speeds were feasible, students were soon cutting many of the cabochons to be used in the jewelry they were making.

With the single grinding-buffing head assembly upon which all operations were done, much changing of equipment was necessary which was a serious handicap in the shop where a large number of students were involved. It soon became apparent that even this setup was inadequate.

Today we have separate units, each unit with individual motor, for the different operations, and it is not unusual for an advanced student starting with a sawed slab of material to make a finished cabochon in less than an hour.

Students had used so many of the commercial stones most of which are cut abroad and then dyed, that at first they wanted to produce similar stones. Gradually, however, they realized that the natural stones, with natural markings, were far more beautiful, and above all, more individualistic.

Approximately 98 per cent of the cabochons used in the shop today are cut and polished by students. The small number of commercial cabochons that are used generally go into pieces of jewelry that are being made for friends or relatives.

Gem cutting is today definitely a part of the shop curriculum on a nonvocational level. Students design their jewelry, select the rough gem material, grind and polish their cabochon, and then make the mounting.

In the past, a great number of faceted stones, were used by the students, but the increased price of the commercial stones caused by the European war, have reduced the demand. Cabochons, too, have increased tremendously in price, but this has caused our students little worry, as they cut and polish their own.

Cabochon Versus Facet Cutting

Can the craftsman or student cut and polish a faceted stone? The answer is definitely yes.

Facet cutting, however, is not as practical in the average school shop as is cabochon cutting. In the first place there is the problem of raw material. Most of the mines where the best faceting material is produced are owned by syndicates who use their own material. This causes a premium to be placed upon the material that is available.

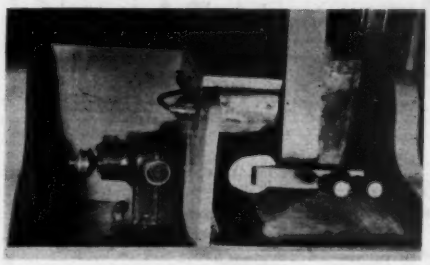


Fig. 1. Sawing on a diamond saw

Facet cutting is much slower than cabochon cutting and if very much is to be done in the average school shop more machines must be available. Diamonds and many of the other faceted gems are held in mechanical clamps and cut and polished upon semiautomatic machines which are set to cut the predetermined angles and planes and when this is done the stones are automatically removed from the lap. One operator usually tends a number of machines.

The student or craftsman must use a faceting index head and cement his stone to a dop which is held in the index head. Then the head must be set so that the correct angle is cut upon the stone being faceted (the indices of refraction of the various kinds of faceted gem stones are different) and the operator must also work out the correct number of facets, as well as the correct proportion for the crown and the pavilion. This in the average class is very difficult, unless the class is small.

Many of the semiprecious faceted stones we see today owe their beautiful colors to heat treatment. One can secure good material, do a good job of faceting, and then unless he knows the secrets of color altering with heat he might be disappointed with the results. This is especially true of zircons.

Of the thousands of amateurs who cut cabochons as a hobby only a small number cut faceted stones.

Steps in Cabochon Cutting

There are four steps in the making of a cabochon. They are: (1) sawing; (2) grinding; (3) sanding, and (4) polishing. Oftentimes one is able to eliminate the first step of sawing by using small pieces and starting them directly on the grinding wheels.

There are two methods of sawing that are available to the student or craftsman. One is the grit saw, which is a revolving disk running in a mixture of silicon carbide grit, water, and clay flour. The other method is the diamond saw, shown in Figure 1, which uses a hard metal disk with bort diamond embedded in the periphery, and running in a mixture of lubricating oil and kerosene. Both saws have their merits.

The diamond saw is much faster and cleaner, and makes a smooth cut, but it costs more per square inch of sawing. Then, too, the diamond saw requires more skill in using, as a blade can be stripped of its diamond by carelessness. The *mud* or grit saw is messy, but little damage can be caused by student, other than the bending of a blade and since these can be easily made of galvanized iron the expense is very low. No precaution has to be taken with bearings with diamond saws, where as with the mud saw bearings have to be fully protected.

The cabochon blank, after being sawed, is usually marked to the desired outline and then ground to rough shape on a No. 100 grit silicon carbide wheel. See Figure 2. The rough-shaped stone is then cemented to a dop stick (short length of dowel) and further shaped on a No. 220 grit silicon wheel.

Silicon carbide wheels are the hardest abrasive wheels manufactured. Boron carbide, another product of the electric furnace, is harder than silicon carbide, but at present is expensive and available only in grit form. It takes a silicon carbide wheel to cut most of the semiprecious gem material which has a hardness of 7 as measured on Moh's scale of hardness.

Water is used to keep the stones cool while being ground, and also to keep the wheel clean. The water can be sprayed on the wheel, under pressure, or the wheel can revolve over a pan of water, the lower edge of the wheel touching the water. In either case the wheels must be well shielded to prevent spraying of water. If the wheel is used running in water, do not allow the wheel to stand in the water.

The correct speed of the periphery of the grinding wheel is approximately 5000 surface feet per minute. The wheel should preferably have a 1-in. face. The author uses a ball-bearing bench grinder which carries wheels 10 in. in diameter by 1-in. face, and hundreds of stones can be cut on this wheel before it is worn down to a diameter which is too small to use.

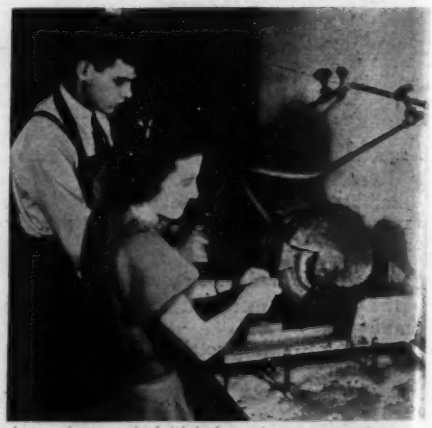


Fig. 2. The stones are ground to shape on silicon carbide wheels. Water keeps the stones cool

Fig. 3. Cabochon gem stones are sanded upon resilient abrasive coated disks to remove imperfections left in grinding

The cabochons are next *sanded*. This is done upon an abrasive covered wood disk which has been covered with felt or sponge rubber. See Figure 3. Silicon carbide coated cloth, No. 220 grit, can be stretched over the disk and fastened with a hoop, or heavy canvas can be tacked over the sponge rubber, the canvas coated with thinned glue or silicate of soda (waterglass) and the grit poured on the glue. No water is used in the sanding.

The cabochons are polished upon a hard felt wheel or a muslin buffer using tin oxide, or some commercial polishing powder mixed with water. See Figure 4.

How to Get Started

Very little cash outlay is needed to assemble an outfit upon which cabochons can be ground and polished. A grinding-buffing head, with four-step pulley and a quarter horsepower motor are sufficient unless one plans to cut many stones, or a large group is dependent upon the setup. Splash pans and guards can usually be made. Small silicon carbide wheels either 6 or 8 in. in diameter are inexpensive. This together with one or two pounds of No. 220 grit for the sander are usually sufficient for a start. A muslin buff can be used for polishing, or an old felt hat can be cut into small disks and used for the purpose.

It has been the author's privilege to correspond with, and visit many amateur lapidarists. Many have a setup similar to that just described with which they produce fine cabochons. In one shop in a western city where Indians were cutting turquoise on a commercial basis, the water was supplied to the wheels from a ten gallon milk can elevated above the wheels.

The sawing of the material is the hardest part of the job. The beginner who wishes to try his hand can buy from various dealers cabochon size blanks at nominal prices, which for the average run of material cost from 10 to 15 cents each.

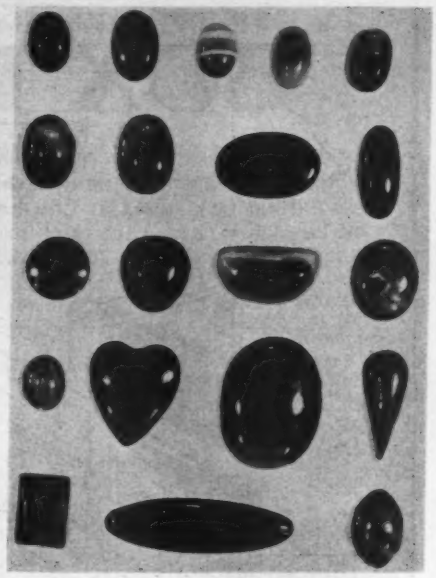


Fig. 5. Cabochons cut by students. Note the varied markings

Figure 5 shows a number of beautiful cabochons cut by students.

Semiprecious Gem Material

There is a wealth of semiprecious gem material in the United States. Much of this is found in the western states. It is found as waterworn boulders of various sizes along streams, as float lying upon the desert or on the seashore, and in many localities it may be dug out of the ground.

Among the native materials which make excellent cabochons are the various agates, jaspers, and the agatized and petrified woods. One never knows what pattern the piece of rough material will produce until it is sawed and ground to shape. Many scenic effects are produced.

Other materials that are excellent and favorites of high school students are the banded agates from Brazil, lapis lazuli from Chile, and the tigereye from Africa. More expensive materials which produce beautiful cabochons are jade from Burma, and the precious opal from Australia. Both of these may be easily worked on silicon carbide wheels.

The bulk of the semiprecious material costs from one to two dollars per pound, plus postage. This means low cost per cabochon blank.

Jewelry Making in High School

Jewelry making is fascinating to the average high school student. It gives them an opportunity to make something they really want, that will be worn and admired by their friends. They know that the finished piece will be inspected closely by friends, and they are, therefore, willing to take the utmost pains in the fabrication of the article.

John came into the author's class without any previous experience in jewelry making. He soon mastered the art of silver soldering and learned to cut his own cabochons and in a short time was producing excellent work. John's father visited the shop and stated that he did not know what had happened to the boy. "John has taken other kinds of shopwork and seemed to have formed the attitude that 'fair' was good enough for anything he did," his father explained, "but now he cannot get his jewelry good enough." John soon began decorating silver rings with gold, sawing out all his decorations from sheet gold. His father again visited the shop, this time wearing a gold embellished ring with a beautiful agate cabochon which John had made for him. John made another ring which he sold for three times what it cost him. He is now making another and better ring for himself. He has his own blowtorch, files, etc., at home and spends much time at home working at the art.

Jewelry making also appeals to girls for here is an opportunity to make the things they want. Most of those who enter our shop are without previous shop experience but their work equals that of the boys. They cut and polish their own stones and in many instances will spend more time with unique designs than will boys. They soon learn that girls can use the same tools that boys use.

Equipment for Jewelry Making

Contrary to popular belief few tools are required in the making of hand-wrought jewelry. The essential tools are: jeweler's saw, ring mandrel, assortment of pliers, jeweler's files, blowpipe (or blowtorch), and charcoal or asbestos block for soldering, a pickling pan for use in removing the glazed borax and oxide, and a buffer for polishing.

The fashioning of handmade rings, pendants,

Fig. 4. The cabochon is polished upon a hard felt wheel using tin oxide as an abrasive

Fig. 6. Students of Woodrow Wilson High School, Washington, D. C., at work grinding and polishing gem stones and making jewelry from wire and sheet silver

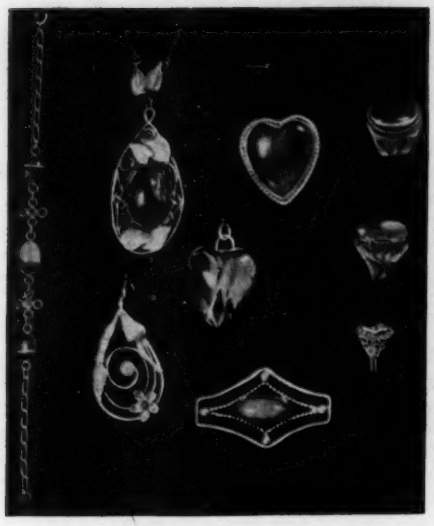


Fig. 7. Jewelry made by students

brooches, necklaces, pins, etc., calls for the designing of the piece, the making of the bezel for the stone; the mounting, or in the case of rings, the shank; decorating, which is usually done with twisted or beaded wire, leaves, or silver "shot"; polishing, and finally the setting of the stone.

Despite the fact that silver solder flows at a temperature of from 1350 to 1600 degrees Fahrenheit, depending upon the composition of the solder, silver soldering is not hard to learn. When one remembers that the joint must be clean, free of oxide, and of a good fit; that a flux must be used (borax in water) on both joint and solder, and that the entire piece must be heated, little trouble will be encountered. Gold solder works as easily as silver solder.

Visual Teaching Aids

Finished models of various pieces of jewelry are kept on display in a glass cabinet in the shop. They are of inestimable value to all students, especially beginners many of whom are girls who previously had never had a tool in their hands.

Students often bring in commercial jewelry and are able to repair it or alter its design. Those students, who have advanced far enough, also prepare their own designs.

It is almost an unwritten law in the classes that when an exceptionally good piece is made, the student will have to make another for the permanent display cabinet, the instructor personally furnishing the silver and gem material. Students are glad to do this for word soon goes around as to who made it. This causes friendly rivalry between good students, with Jack remarking: "If Harry did that, I can do it," and generally he does, oftentimes with Harry assisting or giving minute instruction on the fine points. Exceptionally good students frequently spend considerable time experimenting on new or unique designs for the display cabinet.

Numerous cabochons are kept on display, as well as pieces of the rough material from which they were cut. Thus students are able to see both rough and finished stone.

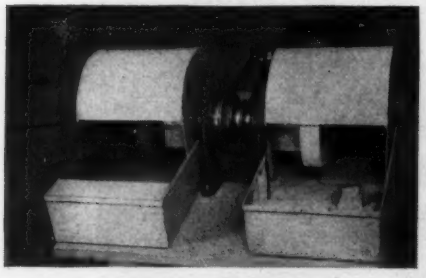
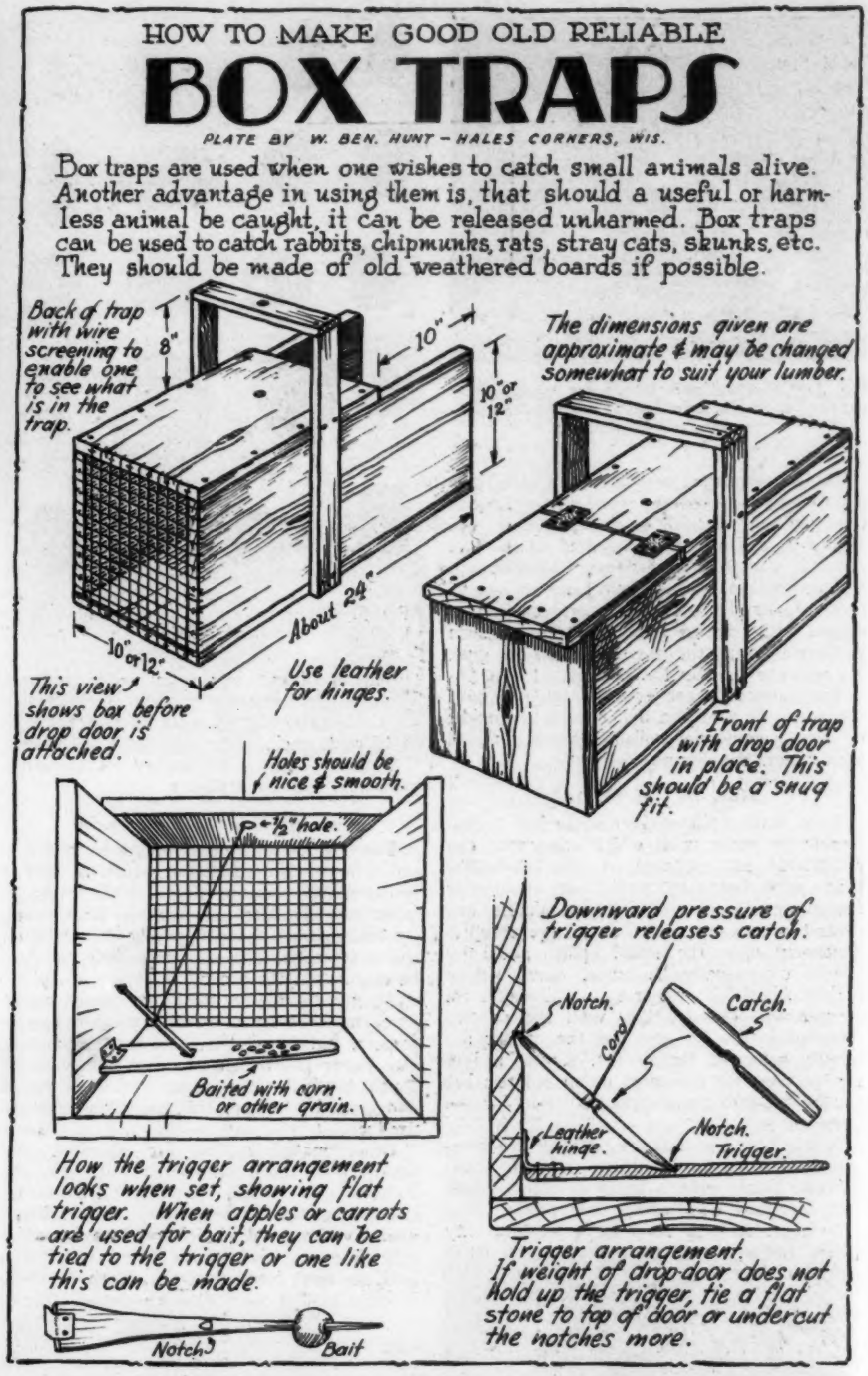
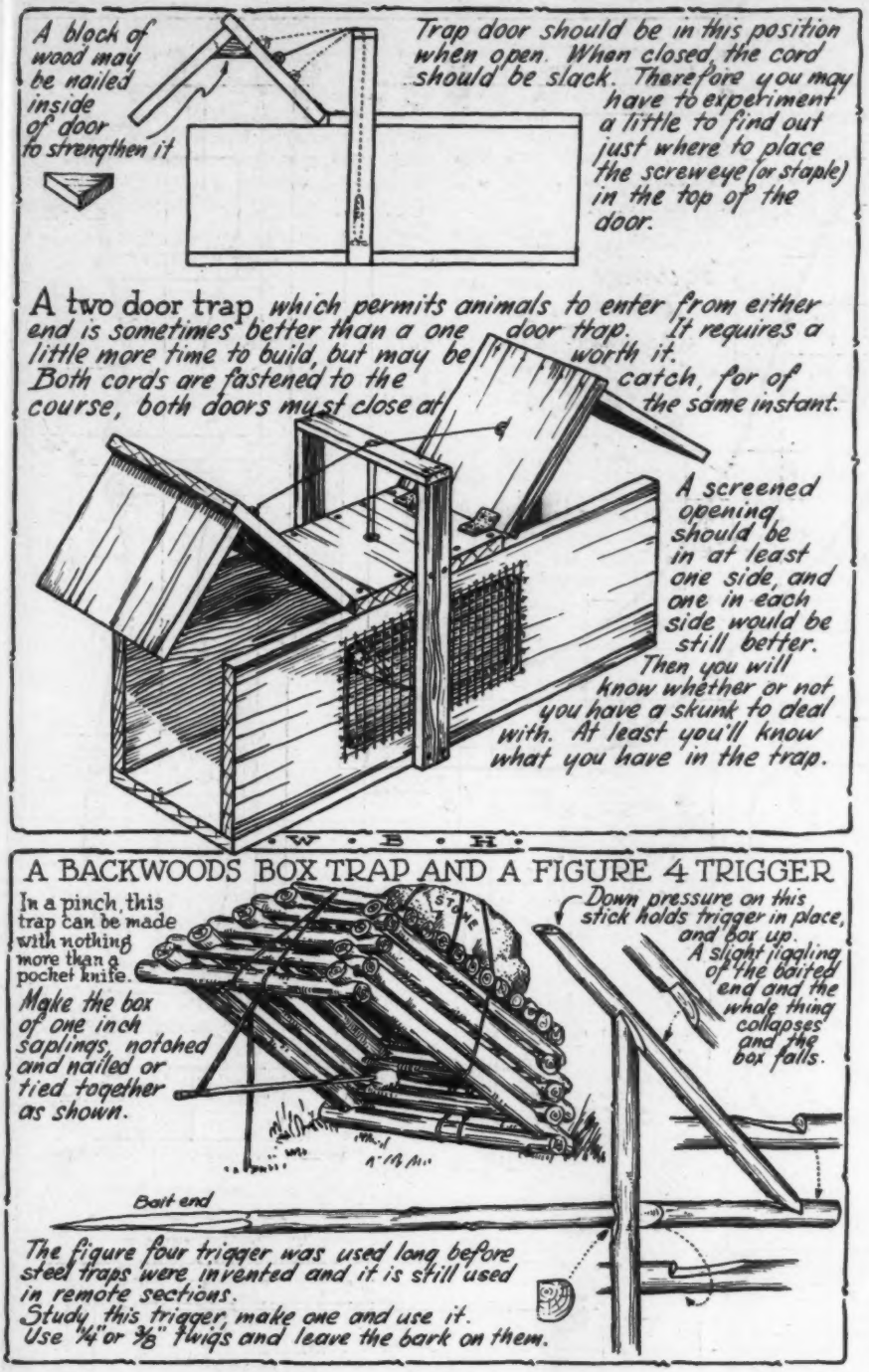


Fig. 8. Gem grinding outfit suitable for shop or home use. Grinding is done on wheel at left, which runs in water held in the sump. Sanding and polishing are done on the right hand side


HOW TO MAKE GOOD OLD RELIABLE
BOX TRAPS
PLATE BY W. BEN. HUNT – HALES CORNERS, WIS.
Box traps are used when one wishes to catch small animals alive. Another advantage in using them is, that should a useful or harmless animal be caught, it can be released unharmed. Box traps can be used to catch rabbits, chipmunks, rats, stray cats, skunks, etc. They should be made of old weathered boards if possible.
Back of trap with wire screening to enable one to see what is in the trap.
8"
10"
10" or 12"
About 24"
10" or 12"
This view shows box before drop door is attached.
Use leather for hinges.
The dimensions given are approximate & may be changed somewhat to suit your lumber.
Front of trap with drop door in place. This should be a snug fit.
Holes should be & nice & smooth.
½" hole.
Baited with corn or other grain.
How the trigger arrangement looks when set, showing flat trigger. When apples or carrots are used for bait, they can be tied to the trigger or one like this can be made.
Notch
Bait
Downward pressure of trigger releases catch.
Notch.
Catch.
Cord
Leather hinge.
Notch. Trigger.
Trigger arrangement. If weight of drop door does not hold up the trigger, tie a flat stone to top of door or undercut the notches more.

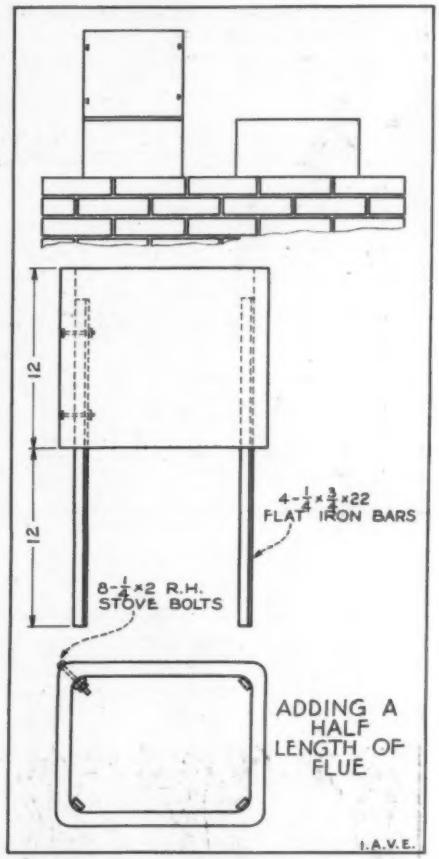
One of the prized "aids" is a large scrapbook in which are kept photographs of many of the finished pieces of jewelry, magazine articles, and various clippings from newspapers, trade magazines, catalogs, etc., relating to art metal, jewelry or gem cutting. Students are encouraged to bring in these clippings and in this way many new ideas are obtained. Many of the pieces shown in the scrapbook will never be made in the school shop but it is remarkable the ideas that students get from the clippings. Modern youth, if vitally interested in what he is doing, hates to pass up a challenge.


A block of wood may be nailed inside of door to strengthen it
Trap door should be in this position when open. When closed, the cord should be slack. Therefore you may have to experiment a little to find out just where to place the screweye (or staple) in the top of the door.
A two door trap which permits animals to enter from either end is sometimes better than a one door trap. It requires a little more time to build, but may be worth it. Both cords are fastened to the catch, for of course, both doors must close at the same instant.
A screened opening should be in at least one side, and one in each side would be still better. Then you will know whether or not you have a skunk to deal with. At least you'll know what you have in the trap.
W B H
A BACKWOODS BOX TRAP AND A FIGURE 4 TRIGGER
In a pinch this trap can be made with nothing more than a pocket knife.
Make the box of one inch saplings, notched and nailed or tied together as shown.
STONE
Down pressure on this stick holds trigger in place, and box up. A slight jiggling of the baited end and the whole thing collapses and the box falls.
Bait end
The figure four trigger was used long before steel traps were invented and it is still used in remote sections. Study this trigger, make one and use it. Use 1/4" or 3/8" twigs and leave the bark on them.

ADDING A HALF LENGTH OF FLUE

F. W. Dejmek,
Marinette, Wisconsin

Sometimes when two flues project the same distance above the chimney, one flue interferes with the draft of the other flue. This may be overcome by extending the one that does not have sufficient draft. The new length or part of a flue length that is to be added must be securely fastened to make sure that during a severe storm the flue is not toppled off the chimney. An addition can safely be made by fastening four iron bars to the flue as shown in the illustration. Bolt the bars to the inside corners, allowing about 12 in. to extend beyond the end of the flue. That portion of the bars extending beyond the flue will fit snuggly inside of the flue in the chimney and prevent the additional section from being toppled off regardless of the direction of the wind. Apply mortar between the flue sections. To prevent the bars from rusting, apply a coat or two of aluminum paint to both bolts and bars before fastening them to the flue.



Anyone who has had little or no experience with flues may wonder how holes can be bored through the material of which they are made. This can be done by using a small three cornered file. Break a small piece off the end of the file and use the remainder as a bit in a brace. It will be found that a hole can be bored through the flue in a very short time. When the broken end of the file becomes rounded, break off another small piece to form new sharp corners.

Books and Magazines

The following books and magazines will help those who are interested in jewelry and gem cutting, either as an avocation, or as an addition to the art metal shop:

Jewelry, Gem Cutting, and Metalcraft, William T. Baxter (New York City: McGraw-Hill Book Co.), $2.50.

Metalcraft and Jewelry, Emil F. Kronquist (Peoria, Ill.: The Manual Arts Press), $2.25.

Jewelry Making and Design, Rose and Cirino (Providence, R. I.: The Metal Crafts Supply Co.), $10.25.

Small Jewelry, F. K. Smith (New York City: Pitman Publishing Co.), $1.00.

Gems and Gem Material, Kraus and Slauson (New York City: McGraw-Hill Book Co.), $3.50.

Getting Acquainted with Minerals, George Letworth English (New York City: McGraw-Hill Book Co.), $2.50.

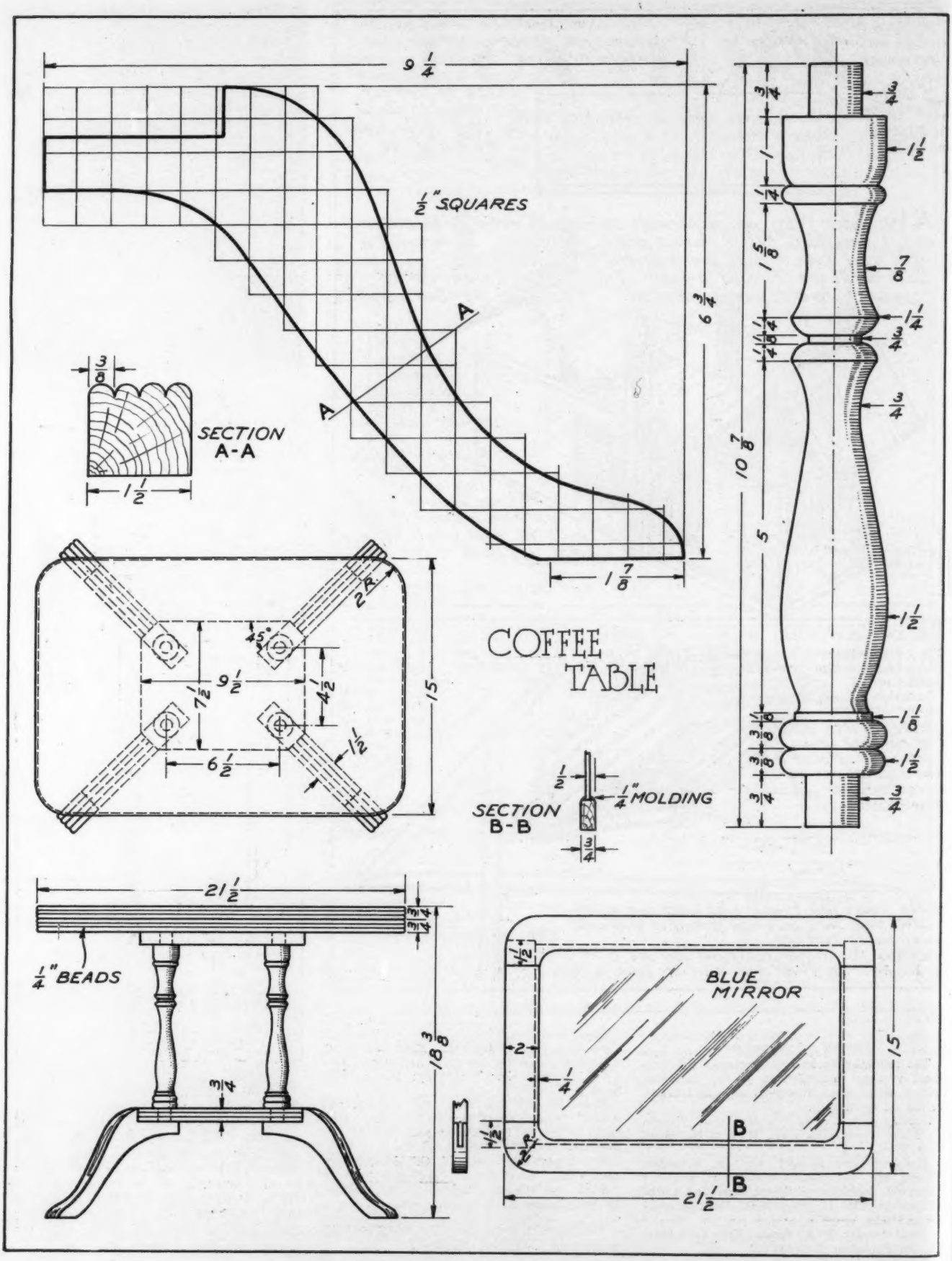
Quartz Family Minerals, Dake, Fleenor, and Wilson (New York City.: McGraw-Hill Book Co.), $2.50.

Magazines

The Mineralogist. Portland, Ore. Monthly. 20 cents a copy. $2.00 a year.

Rocks and Minerals. Peekskill, N. Y. Monthly. 20 cents a copy. $2.00 a year.

Initiative is doing the right thing without being told. — *Elbert Hubbard.*

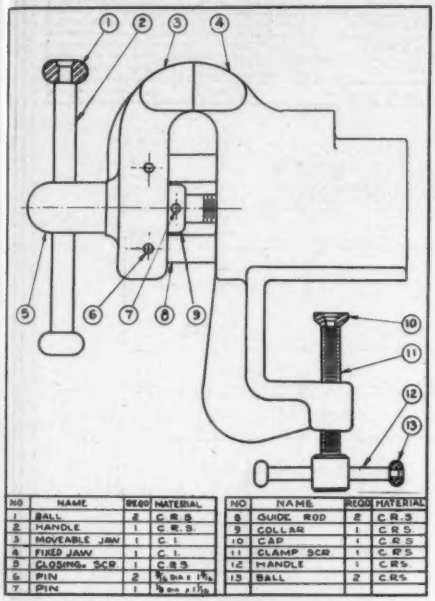


Coffee table, submitted by Earl Lewis, Kenosha, Wisconsin

A HANDY VISE

Alfred C. Erickson,
Bessemer, Alabama

The vise shown in Figure 1 will be found very useful in the school or home shop. It may well be used in the school shop as a "first project" for the machine shop, as it meets the following requirements:



NO	NAME	REQD	MATERIAL
1	BALL	2	C R S
2	HANDLE	1	C R S
3	MOVEABLE JAW	1	C I
4	FIXED JAW	1	C I
5	CLOSING SCR	1	C R S
6	PIN	2	⅜ DIA x 1⅝
7	PIN	1	⅜ DIA x 1⅛

NO	NAME	REQD	MATERIAL
8	GUIDE ROD	2	C R S
9	COLLAR	1	C R S
10	CAP	1	C R S
11	CLAMP SCR	1	C R S
12	HANDLE	1	C R S
13	BALL	2	C R S

Fig. 1. Vice assembly and bill of materials.

1. Something the student would be familiar with and for which he could see an immediate use.
2. Maximum value and minimum cost to student.
3. Large enough for practical use and has a *commercial appearance.*

The drill jig used for the three principle holes in each jaw casting was made by advanced students. It makes the spoilage of castings almost impossible.

An investigation of this vise will disclose that the operations usually covered in a first semester course are required in its manufacture. A brief outline of these operations follow:

Bench: Simple layout, using taps and dies, hand reaming, riveting, filing and polishing.

Lathe: Chucking, facing, straight turning, use of calipers, drilling and center drilling, countersinking, work between centers, turning to shoulder, cutting off, chamfering, radius forming, filing and polishing, thread cutting.

Drill Press: Drilling to layout, countersinking, reaming, use of drill jig.

Shaper: Verticle shaping, horizontal shaping.

Routing sheets similar to those used in industry were devised to help the worker. Operations are listed in groups and designated, insofar as is possible, what should be done in a single *setup.*

Method of Procedure

Guide Rod, Part No. 8

1. Chuck stock true, face end, turn chamfer.
2. Reverse stock in chuck, face to length, turn 1/16 in. radius, file and polish radius.

Handle, Part No. 2

1. Chuck true, face end, turn to 5/16 in. dia. for distance of ½ in.
2. Repeat on opposite end.

Handle, Part No. 12

1. Same as for Part No. 2 except dimensions.

Ball, Part No. 1

1. Chuck true, face end, turn to 13/16 in. dia., turn 7/32 in. radius, drill 5/16 in. dia. hole 9/16 in. deep, countersink to 13/32 in. dia., file and polish, cut off.

Ball, Part No. 13

1. Same as for Part No. 13 except for dimensions.

Clamp Screw, Part No. 11

1. Center stock, face ends, turn the ⅜ in. dia., turn to 3/16 in. dia. for length of 5/16 in., chamfer and square up corners as required.
2. Drill 17/64 in.
3. Cut thread ⅜ in. — 16 NC. Use die for cutting this thread.

Closing Screw, Part No. 5

1. Center stock, face ends, turn to 9/16 in. for length of 6⅜ in., chamfer, square up shoulder, turn ½ in. radius, file and polish, cut 9/16 in. — 12 NC thread (Single tool).
2. Drill 29/64 in.

Cap, Part No. 10

1. Chuck stock, turn ⅝ in. dia., chamfer, drill 3/16-in. hole 5/16 in. deep, and countersink to 5/16 in. dia., cut off.

Collar, Part No. 9

1. Chuck stock, drill 9/16 in. for press fit 7/16 in. deep, form 1/16 in. radius, cut off ⅜ in. long.

Fixed Jaw, Part No. 4

1. (Drill jig.) Drill two 35/64-in. holes and ream 9/16 in., also tap drill center hole 15/32 in.
2. Layout for the two drilled and countersunk holes and also the tapped hole.
3. Drill ¼ in. and countersink to 7/16 in. dia. two holes, also tap drill 5/16 in.
4. Tap ⅜ in. — 16 NC and 9/16 in. — 12 NC.

Movable Jaw, Part No. 3

1. (Drill jig.) Drill two 9/16-in. holes for press fit, drill center hole 35/64-in. hole and ream 9/16 in., spot face both ends of center hole.

Closing Screw Sub Assembly

1. Assemble one ball on end of handle and

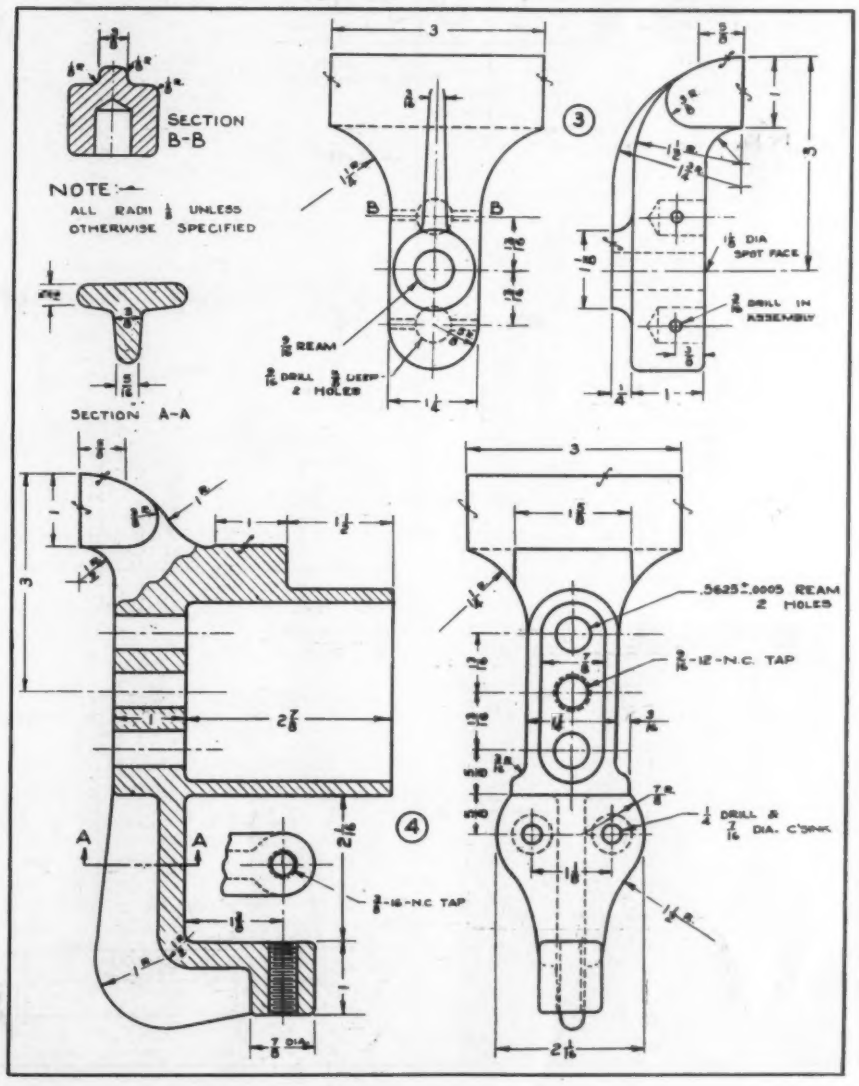


Fig. 3. Details of cast parts of vise

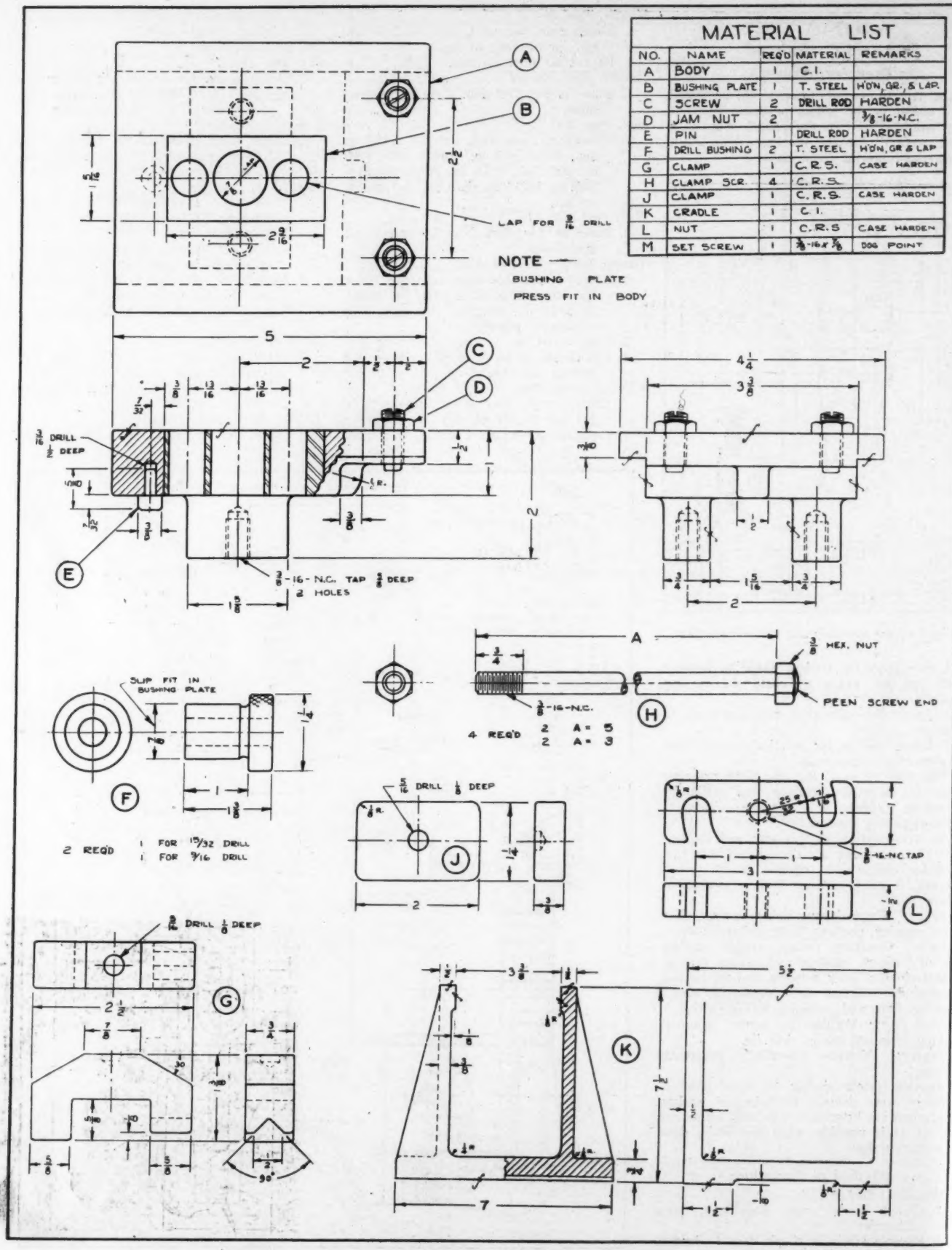
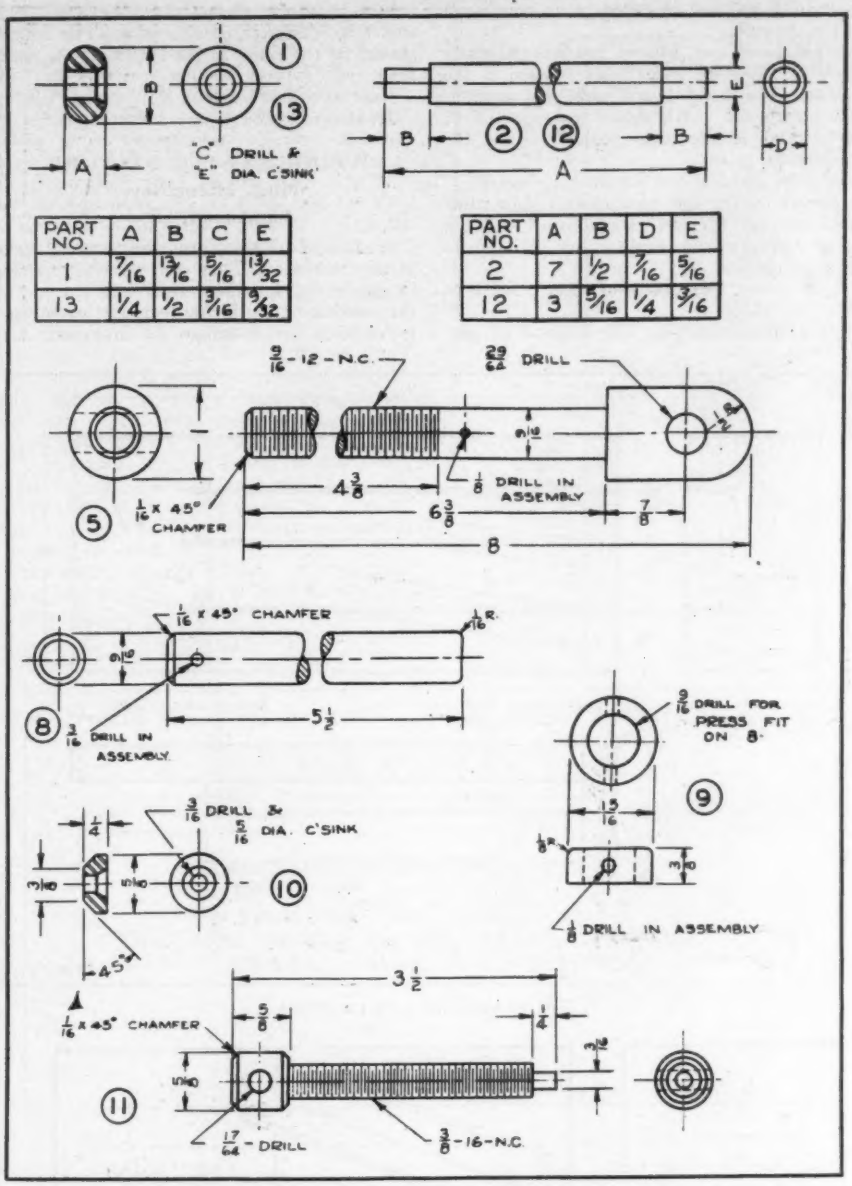

MATERIAL LIST
NO. | NAME | REQ'D | MATERIAL | REMARKS
A | BODY | 1 | C.I. |
B | BUSHING PLATE | 1 | T. STEEL | H'DN, GR., & LAP.
C | SCREW | 2 | DRILL ROD | HARDEN
D | JAM NUT | 2 | | 3/8-16-N.C.
E | PIN | 1 | DRILL ROD | HARDEN
F | DRILL BUSHING | 2 | T. STEEL | H'DN, GR & LAP
G | CLAMP | 1 | C.R.S. | CASE HARDEN
H | CLAMP SCR. | 4 | C.R.S. |
J | CLAMP | 1 | C.R.S. | CASE HARDEN
K | CRADLE | 1 | C.I. |
L | NUT | 1 | C.R.S | CASE HARDEN
M | SET SCREW | 1 | 3/8-16 x 3/8 | DOG POINT
LAP FOR 3/16 DRILL
NOTE
BUSHING PLATE
PRESS FIT IN BODY
3/8-16-N.C. TAP 3/8 DEEP
2 HOLES
SLIP FIT IN BUSHING PLATE
2 REQ'D 1 FOR 15/32 DRILL 1 FOR 5/16 DRILL
4 REQ'D 2 A = 5 2 A = 3
3/8 HEX. NUT
PEEN SCREW END
5/16 DRILL 1/8 DEEP
3/8-16-N.C. TAP
3/16 DRILL 1/8 DEEP
90°

Fig. 2. Drill jig used in making a number of these vises



PART NO.	A	B	C	E
1	7/16	13/16	5/16	13/32
13	1/4	1/2	3/16	9/32

PART NO.	A	B	D	E
2	7	1/2	7/16	5/16
12	3	5/16	1/4	3/16

Fig. 4. Details of steel parts of vise

peen as required. Put handle through closing screw and assemble second ball.

Clamp Screw Sub Assembly

1. Same as closing screw.

Assembly

1. Press guide rods into movable jaw. Place closing screw assembly in position and press on collar.
2. Drill two 3/16-in. and one ⅛-in. hole for pins, countersink each as required.
3. Drive and rivet pins in position.
4. Place movable jaw assembly in position with fixed jaw and adjust jaws to an opening of 1¼ in. by clamping a piece of stock 2¼ in. long between jaws, just above upper guide rod.
5. Mount in shaper and machine jaw faces, close vise jaws snugly, machine top and sides of jaws and also top of anvil.
6. Grind top of jaws for 1½ in. radius.
7. File and polish machined portion of casting.
8. Screw clamp screw assembly in fixed jaw, place cap in position and peen over end of screw.

SUBSOIL IRRIGATOR

Rex Aton,

Minot, North Dakota

The subsoil irrigator, illustrated herewith, is a very popular project in the drouth-stricken areas for watering the roots of trees and shrubbery. There are several models in use but the one illustrated here is very satisfactory. It offers practice in several plumbing operations and also directs attention toward the preservation of trees which form one of our most valuable national resources.

The subsoil irrigator shown in Figure 1 may be made of galvanized iron pipe and fittings which give it a good appearance and help to eliminate rusting. However, the use of black iron will somewhat reduce the cost of the materials, and give very satisfactory results

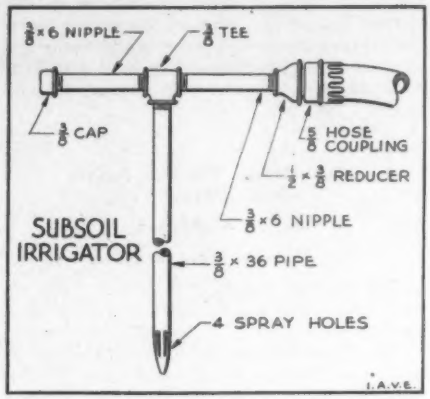


Fig. 1. Details

Bill of Materials

No. Required	*Size*	*Name of Part*
1	5/8"	Hose coupling
1	½" x 3/8"	Reducer
2	3/8" x 6"	Nipples
1	3/8"	Tee
1	3/8" x 36"	Pipe
1	3/8"	Cap

A valve may be inserted in the ground pipe just below the handle to control the flow of water. This is for convenience only, adding to the cost of the project and is not necessary for its successful operation.

Method of Construction

Figure 1 shows how the various parts are assembled. The hose coupling is soldered or brazed into the ½-in. opening of the reducer for attaching the hose.

The point on the ground pipe may be left blunt or may be formed as shown in Figure 1. This point is formed by sawing out four sections about 2 in. long in the end of the pipe. Draw the four points together and solder or braze the ends together, leaving four spray holes above the point.

Method of Operation

Attach the subsoil irrigator to the hose and turn on the water. Insert it into the ground as shown in Figure 2 by pushing down and occasionally twisting it from left to right. The flow of water through the point will assist in forcing the irrigator into the ground. The tree should be irrigated at several points

Fig. 2. How the subsoil irrigator is used

about its roots, leaving the irrigator in the ground for several minutes depending upon the dryness of the soil. After withdrawing the irrigator from the ground, the hole should be filled to keep the air from drying out the soil.

MOLDING TOOLS AND EQUIPMENT

N. A. McMillan,
Elmira, New York

The cost of installing a foundry unit is very low compared to other activities in a general shop.

The following list of equipment can be quoted by foundry supply companies in your locality. For one unit of work or for one student, all the equipment listed in the first column is necessary. The items marked with the asterisk will be included and the items marked with an "X" will not be included:

Equipment	Unit No.1	Unit No.2	Unit No.3
1 Wood flask, 12" x 16" x 5" x 5"	*	*	*
500 Lbs. Albany sand	*	X	*
250 Lbs. core sand	*	X	X
100 Lbs. binder	*	X	X
5 Lbs. graphite	*	*	*
25 Lbs. parting sand	*	*	*
1 Shovel	*	*	X
1 Fr. bench rammers	*	*	X
1 #4 18" Galvanized riddle	*	*	*
1 #12 18" Brass	*	*	*
1 Molders trowel round, 1"x4½"	*	X	X
1 Yankee slick, 1/4" round, 1/2"	*	*	*
1 Oval spoon and slick 3/4"	*	X	*
1 Bench duster	*	X	*
1 9" Cyclone calfskin bellows	*	X	X

Extras

1 Blower for melting furnace
1 (Or more) Crucibles to suit furnace
1 Ladle, cast iron

Additional Equipment to Be Made in a General Shop

Draw pin for wood patterns, threaded and ground to a point, made from ¼-in. drill rod.

Draw screw for metal patterns, made of ¼-in. drill rod and threaded to fit the thread in the pattern.

Mold board and bottom board is generally made of 1-in. pine with cleats screwed to the bottom. The mold board must be straight. The length and width should match the flask to be used, letting edges project beyond the flask about ¼ in.

Melting furnace. See Figure 1 for details.

Blower for the melting furnace can be made from an old vacuum cleaner with a globe valve between the furnace and blower to regulate the air.

Gate cutter. Use a piece of sheet brass, bent in a "U" shape.

Sprue and riser pin. Use a piece of pine turned to ¾ in. diameter on the small end and 1 in. diameter on the other. The length should be the same as the depth of the cope flask.

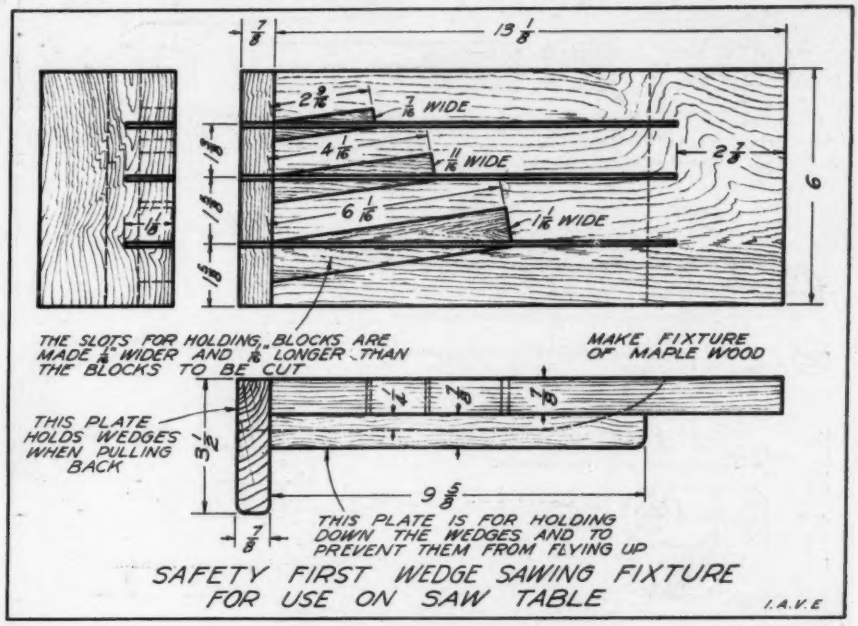
Vent wire. One piece of No. 14 wire.

Mold bench. See Figure 2 for details.

WEDGE-SAWING FIXTURE

Hugh Humphreys,
Cincinnati, Ohio

Wedges of all sizes are a very useful item in any workshop. They are especially useful in gluing up, springing work into place, and for leveling up work. Another use for wedges is found in wedge designs for marquetry and



The wedge-sawing fixture details

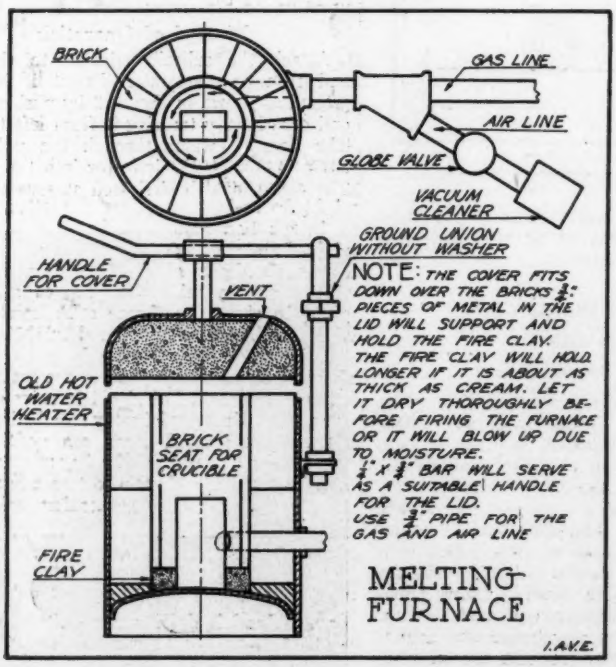

BRICK
GAS LINE
AIR LINE
GLOBE VALVE
VACUUM CLEANER
GROUND UNION WITHOUT WASHER
HANDLE FOR COVER
VENT
NOTE: THE COVER FITS DOWN OVER THE BRICKS ½" PIECES OF METAL IN THE LID WILL SUPPORT AND HOLD THE FIRE CLAY. THE FIRE CLAY WILL HOLD LONGER IF IT IS ABOUT AS THICK AS CREAM. LET IT DRY THOROUGHLY BEFORE FIRING THE FURNACE OR IT WILL BLOW UP DUE TO MOISTURE. ¼" X ¾" BAR WILL SERVE AS A SUITABLE HANDLE FOR THE LID. USE ¾" PIPE FOR THE GAS AND AIR LINE
OLD HOT WATER HEATER
BRICK SEAT FOR CRUCIBLE
FIRE CLAY
MELTING FURNACE
I.A.V.E.

Fig. 1

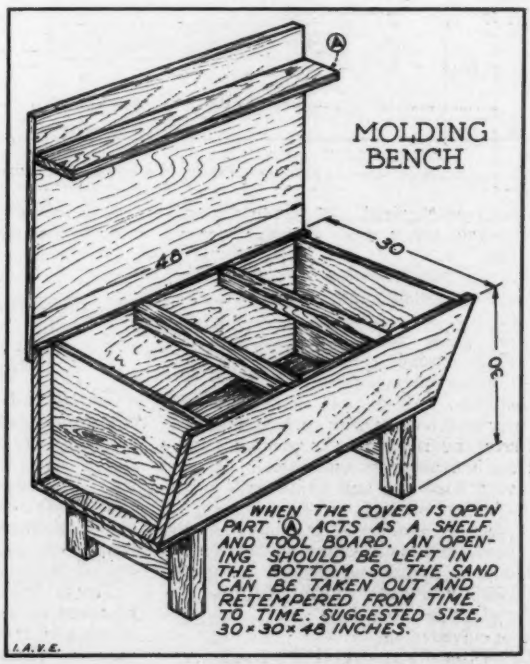
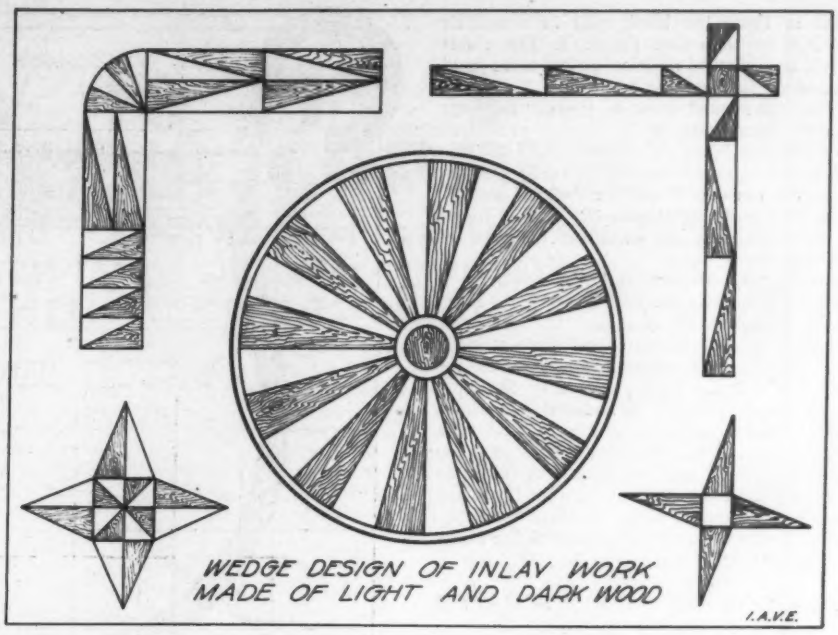

A
MOLDING BENCH
48
30
30
WHEN THE COVER IS OPEN PART A ACTS AS A SHELF AND TOOL BOARD. AN OPENING SHOULD BE LEFT IN THE BOTTOM SO THE SAND CAN BE TAKEN OUT AND RETEMPERED FROM TIME TO TIME. SUGGESTED SIZE, 30 × 30 × 48 INCHES.
I.A.V.E.

Fig. 2

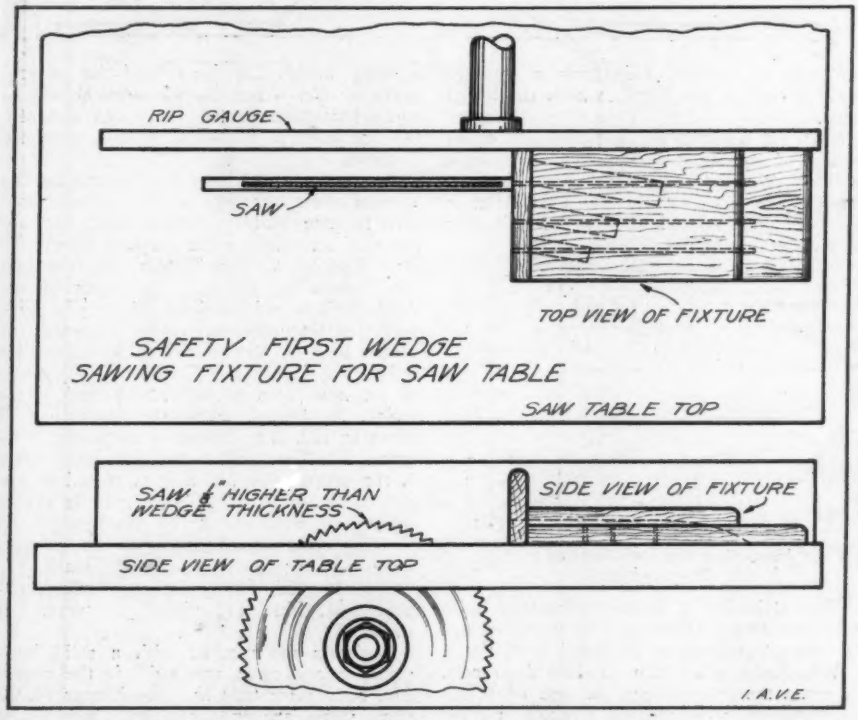
veneer work. Wedges of light and dark color woods, for instance, can be worked up for panels and table tops. They can be inlaid into the wood, or applied so that they are raised 1/16 or ⅛ in. above the surface.

The fixture for cutting wedges is very simple in its construction. There are only three parts. The end piece, ⅞ by 3½ by 6 in.; the bottom piece, ⅞ by 6 by 13⅛ in.; and the top piece, ⅞ by 6 by 9⅝ in. The pockets for holding the pieces or blocks to be cut into wedges, are cut out with a bandsaw, jig saw, or by hand. Then the parts are put together, either with nails, screws, or glue. After the parts are assembled, the saw kerfs are cut on the saw table on which it is to be used. The fixture described and illustrated herewith is detailed to make wedges ⅞-in. butt, 6 in. long; ½-in. butt, 4 in. long; and ¼-in. butt, 2½ in. long. These wedges may be cut out of stock that is 1/16 to ⅞ in. thick. If it is desired to make the fixture for larger or smaller wedges, then the bottom plate must be altered to suit. Always allow 1/16-in. clearance in length and width in making the pockets.

The stock size for sawing ⅞ by 6-in. wedges is 1 by 6 in.; for ½ by 4-in. wedges, ⅝ by 4 in.; and for ¼ by 2½-in. wedges, ⅜ by 2½ in. For thickness of stock any size desired up to ⅞ in. can be used, and the thinner pieces can be stacked in the pockets so that more wedges can be cut at one time. The fixture is used on a saw table in connection with the ripping gauge, as shown.



The wedge as applied to marquetry designs



The method of using the wedge sawing fixture

THUMB INDEXING

James R. Griffith,
Oregon State College,
Corvallis, Oregon

While publishers provide thumb indexes on some books, there are other books for which a thumb index would be highly desirable. This article describes how easily such an index may be installed on any book.

The holes are cut with a ½-in. inside-bevel gouge. The cut is stopped by using a thin strip of oak plywood inserted at the proper page. Soft plywood does not make as clean a cut as the harder material. Sheet zinc or a piece of lead may be used instead of the hardwood. A sharp edge must be maintained on the chisel so that each hole may be cut by a single blow of the hammer. If several blows are necessary to complete a hole, the edges are not smooth.

Two types of bindings are encountered, flexible and stiff backed. The flexible cover may be bent over the edge of the bench in

Tabbing handbooks

order to bring the book edge to a sloping position, as shown in Figure 1. The chisel is held in a vertical position by the same hand that holds the book in position.

The stiff-backed book is pushed sideways until the bound edge of the book is in contact with the bench, as shown in Figure 2. This brings the unbound edge in a sloping position ready for the cut. When the book is brought back to a normal position, the hole is found to taper attaining its maximum diameter at the page in question.

Labels may be hand lettered, but have a homemade appearance. In Figures 1 and 2 are shown partial sheets of labels that were first prepared on the typewriter and then reduced to a 3 by 4 in. photograph. Thus 65 labels for a total of 4 books were prepared on the same sheet. Figure 3 shows an indexed steel-shape book whereon symbolic tabs were used to a large extent. The original drawing and the sheet of printed tabs are shown in the same illustration. These were printed by the offset process on gummed paper, as there were sufficient books to be tabed to warrant the initial cost of making the cut.

WROUGHT-IRON FOOT SCRAPER

Walter C. Van Buren,
High School,
Medina, New York

The wrought-iron foot scraper shown and described herewith, will be found to be especially suitable where time is short, and projects must be limited as to the cost.

A pair of these foot scrapers make an excellent addition to the modern small porch.

The bottom is made of a piece of ⅛ by ¾ by 8 in. band iron, bent and drilled as shown. The upright frame is made of ¼ in. square band iron, 22 in. in length. Care must be taken to get both sides of the upright symmetrical. The crossbar is made of ⅛ by ¾ by 5⅝ in. band iron. The ends must be filed to match the contour of the upright.

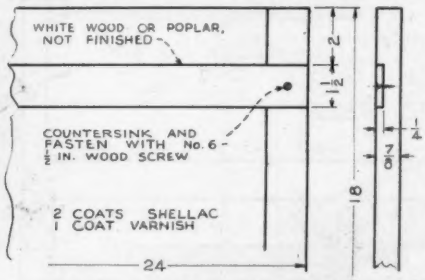
The foot scraper may be made of the plain metal, enameled black, but a more decorative effect will be produced by peening the parts before they are bent. After assembly, the high spots may be brightened up with emery cloth, and a coat of clear lacquer sprayed over the entire surface.

INCREASING THE LIFE OF THE DRAWING BOARD

Arthur F. Schuster,
South Junior High School,
Niagara Falls, New York

To increase the life and usefulness of a drawing board, apply two coats of shellac and one coat of varnish. This gives a smooth, working surface and helps to keep the board clean.

Next, cut a groove in the board into which a piece of unfinished white wood or poplar is inserted. Whenever fastening down drawing paper, place tacks only in this strip. After it has been punched full of tack holes, it may be replaced easily and cheaply.



Increasing the usefulness of the drawing board

This strip has a further advantage as it helps one to mount his sheet in approximately the correct position on the board at all times.

When using other than standard size sheets, or when making tracings, the use of scotch tape eliminates the making of holes in other parts of the board.

RADIO MANUFACTURERS ASSOCIATION RESISTOR COLOR CODE

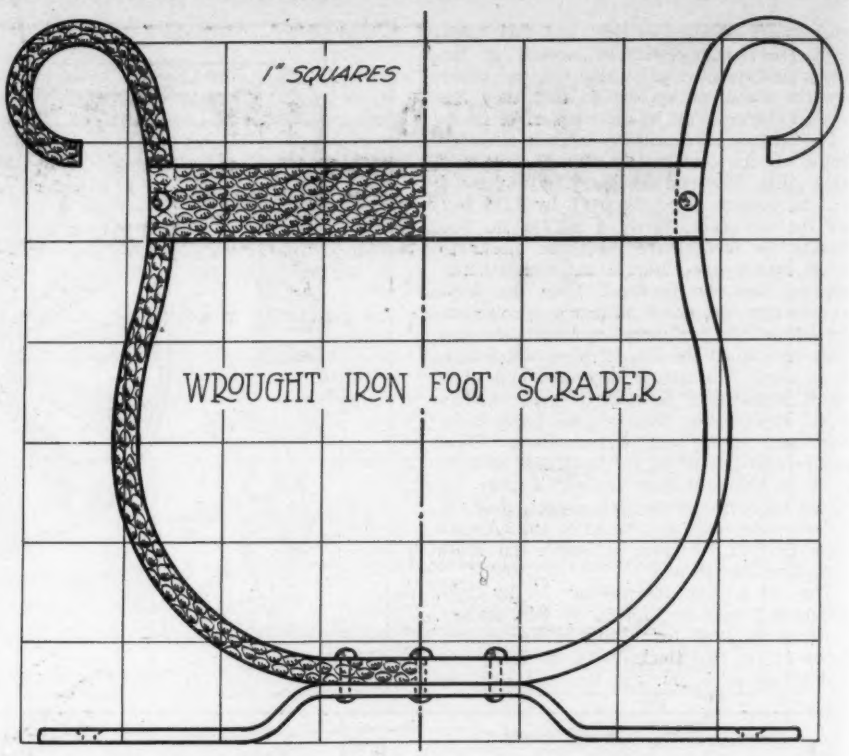
C. O. Morrison
High School,
Lincoln, Nebraska

Although the Radio Manufacturers Association color code is a simple method of marking fixed resistors and small condensers, it is surprising to find that many radio repairmen depend on charts in deciphering the values in actual practice. The following simple memory device has been used for several years by the writer in his radio classes to equip repairmen so that they can instantly tell the value of a resistor without reference to tables.

The code is built up by designating the various colors by means of the numbers from zero to nine inclusive. Black, being the absence of all colors, quite properly stands for zero. Brown is the next integer, one. The next six integers are given to the colors of the rainbow from red to violet. Those who have forgotten that sequence, might memorize the name, Roy G. Biv, in which R stands for red, O for orange, Y for yellow, G for green, B for blue, I is to be ignored, and V for violet. Accordingly then the numeral 2 is given to red, 3 to orange, 4 to yellow, 5 to green, 6 to blue, and 7 to violet. Since white is the opposite of black, it is placed at the end of the scale, as 9. Since gray is almost white we will let it be represented by 8. The color equivalents for the integers from 0 to 9 run as follows: (0) black, (1) brown, (2) red, (3) orange, (4) yellow, (5) green, (6) blue, (7) violet, (8) gray, (9) white.

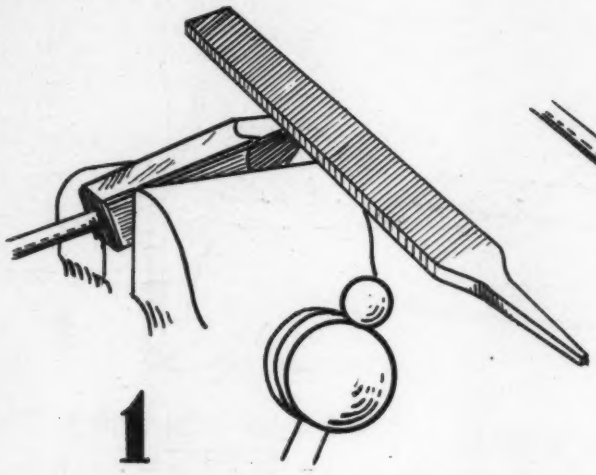
Resistors are marked with a solid body color, an end color, and a dot in the center. The body color tells the first integer of the ohms value, the end color gives the second integer, and the dot color shows the number of ciphers which follow the first two integers. Hence a red body, a green end and a brown dot would mean a 2 and a 5 followed by one zero, or 250 ohms. A yellow body, blue end and yellow dot would be 4-6- four zeros, or 460, 000 ohms. Note that a yellow dot on a yellow body would simply show as the absence of a dot, so if no dot is seen, interpret the dot as being the same color as the body. When the color code is used on condensers, three dots are given in a line. These represent 1st integer, 2nd integer, and number of ciphers. The resulting figure is the number of micro-microfarads. Hence a red-green-brown dot

(Continued on page 377)



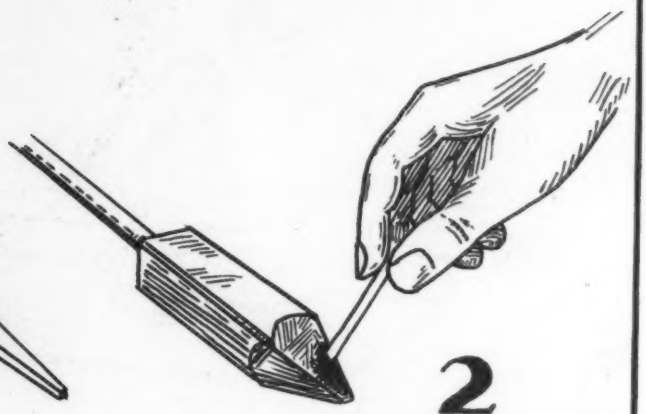
HOW TO TIN A SOLDERING COPPER

IF A SOLDERING COPPER IS HEATED TOO HOT IT TURNS BLACK AND WILL NOT PICK UP SOLDER. IT THEN NEEDS TINNING.



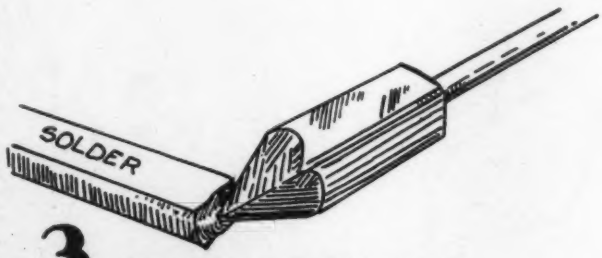
1

HEAT THE SOLDERING COPPER AND WHILE HOT FILE THE POINT UNTIL BRIGHT.



2

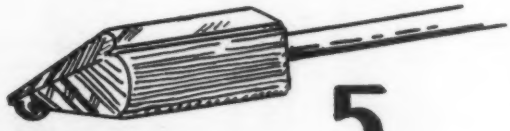
COVER THE POINT WITH SOLDERING FLUX.



3 TOUCH THE HOT CLEAN POINT TO THE SOLDER.

4

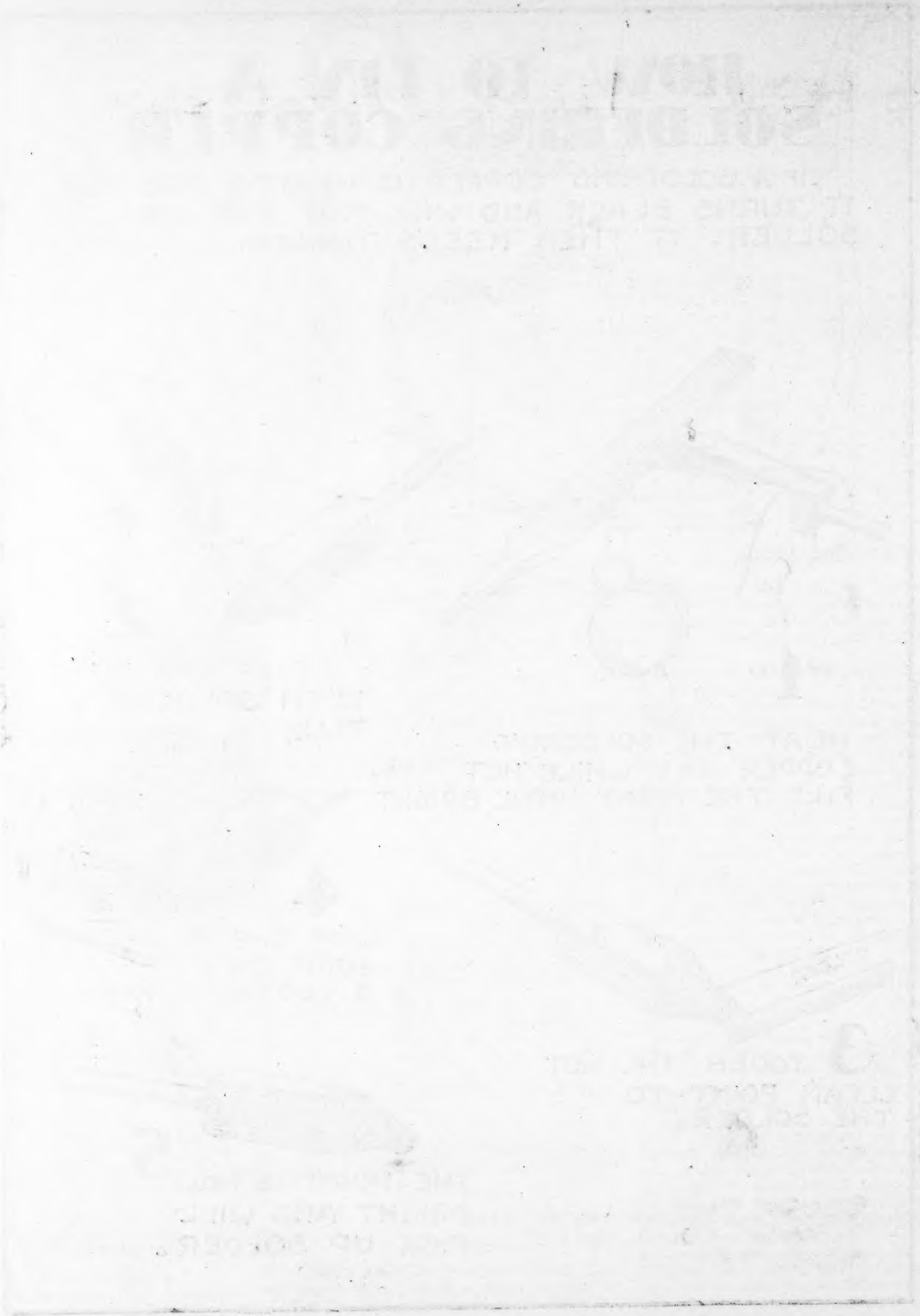
WIPE THE POINT ON A CLOTH.



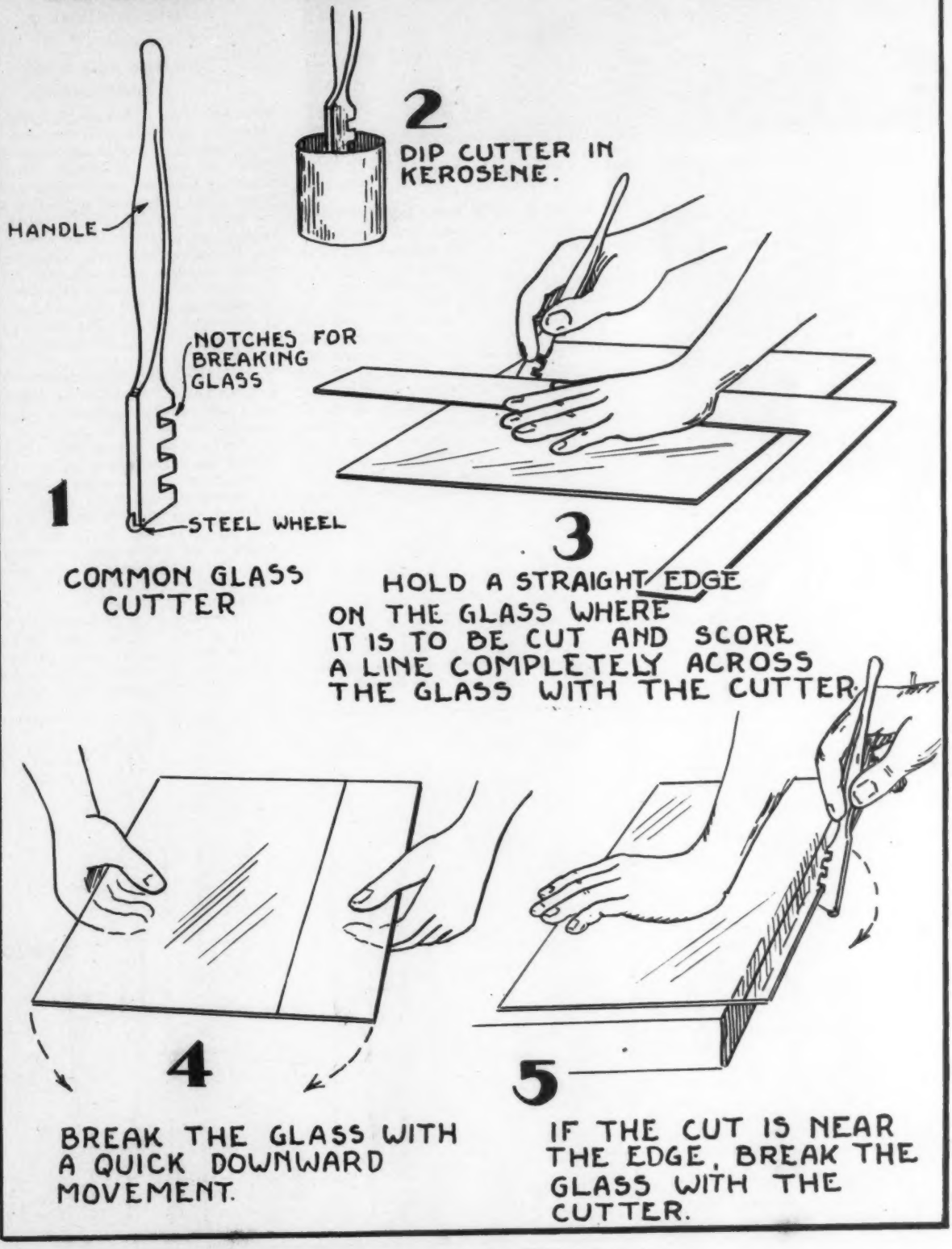
5

THE POINT IS NOW BRIGHT AND WILL PICK UP SOLDER.

Submitted by Fred O. Armstrong, Pennington, New Jersey



HOW TO CUT GLASS


HANDLE
NOTCHES FOR BREAKING GLASS
STEEL WHEEL
1
COMMON GLASS CUTTER
2
DIP CUTTER IN KEROSENE.
3
HOLD A STRAIGHT EDGE ON THE GLASS WHERE IT IS TO BE CUT AND SCORE A LINE COMPLETELY ACROSS THE GLASS WITH THE CUTTER.
4
BREAK THE GLASS WITH A QUICK DOWNWARD MOVEMENT.
5
IF THE CUT IS NEAR THE EDGE, BREAK THE GLASS WITH THE CUTTER.

Submitted by Fred O. Armstrong, Pennington, New Jersey

(Continued from page 372)

combination is 250 mmf or the familiar .00025 mfd value. The entire system is so logically built up that every little practice in its use is needed to make the color code a part of the student's permanent equipment.

A REEDING JIG

E. W. Walker,
Senior High School,
Dothan, Alabama

The reeding jig described and illustrated herewith, was made to be used with a portable router. It works on exactly the same principles as the fluting jig, using the same attachments. There is one exception: a larger *post* must be used as the reeding bit is larger than the fluting bit. The reeding jig does not do as complete a job as the fluting jig, because on tapered turned stock, the reeds will not be uniform throughout. An ordinary paring chisel or preferably a skew-carving chisel and sandpaper will complete the job satisfactorily. At least 75 per cent of the handwork is eliminated by using this jig.

Grinding the Reeding Bit

The reeding bit as shown in the drawing was originally a rounding-over bit. The pilot, or lower round part of the bit, was ground off to a point. This is easily done by placing a rounding-over bit in the router and holding it to a grinding wheel, 5 to 8 in. diameter. Both the grinding wheel and the router are revolving simultaneously. Care must be taken not to burn the bit by grinding it too fast. The bit shown was ground to a ⅜ in. radius. An ordinary drill bit was ground with a ¼ in. radius, and it did work just as satisfactorily. The ¼-in. bit was for smaller reeding. After the rounding-over bit has been ground to the desired radius and to a point as shown, the cutting edge must be backed off, so that the bit will cut. This backing off may be done with the small emery router bits.

The reeding jig set up for use

The Post Used When Reeding

The post used when reeding is 1½ in. at its largest diameter and it is 8 in. long. Both posts shown are dimensioned for a lathe with a 12-in. swing. The posts may be made of any hardwood. They act as depth gauges for the bits. The reeding bit, for instance, extends through the ¾-in. hole in the post to the desired depth for the cut. The flattened side of the post is placed next to the router base. After the reeding jig has been assembled as shown in the illustration, and after the dividing head attachment is locked, and the stock to be reeded is securely fastened between the centers of the lathe, the whole reeding attachment is slid back and forth along the center line of the stock that is to be reeded.

HALL SIGNS

A. H. Schwartz and W. J. Aune,
Tyson Junior High School,
Knoxville, Tennessee

Attractive hall signs may be of great interest to the school and the homecraftsman. In the schools they make excellent correlated projects for students of woodwork, metalwork, and art.

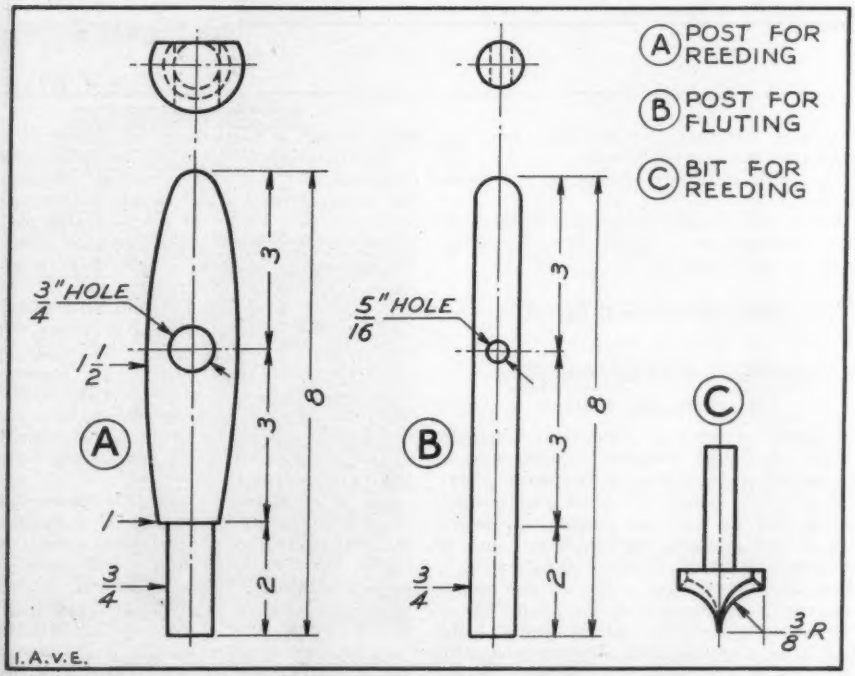
The material used for the sign is ¼-in., 3-ply fir plywood, stain and shellac for the finishing, tempra colors or enamels for painting the names, and screw eyes and hooks for hanging the sign on the bracket.

Method of Procedure

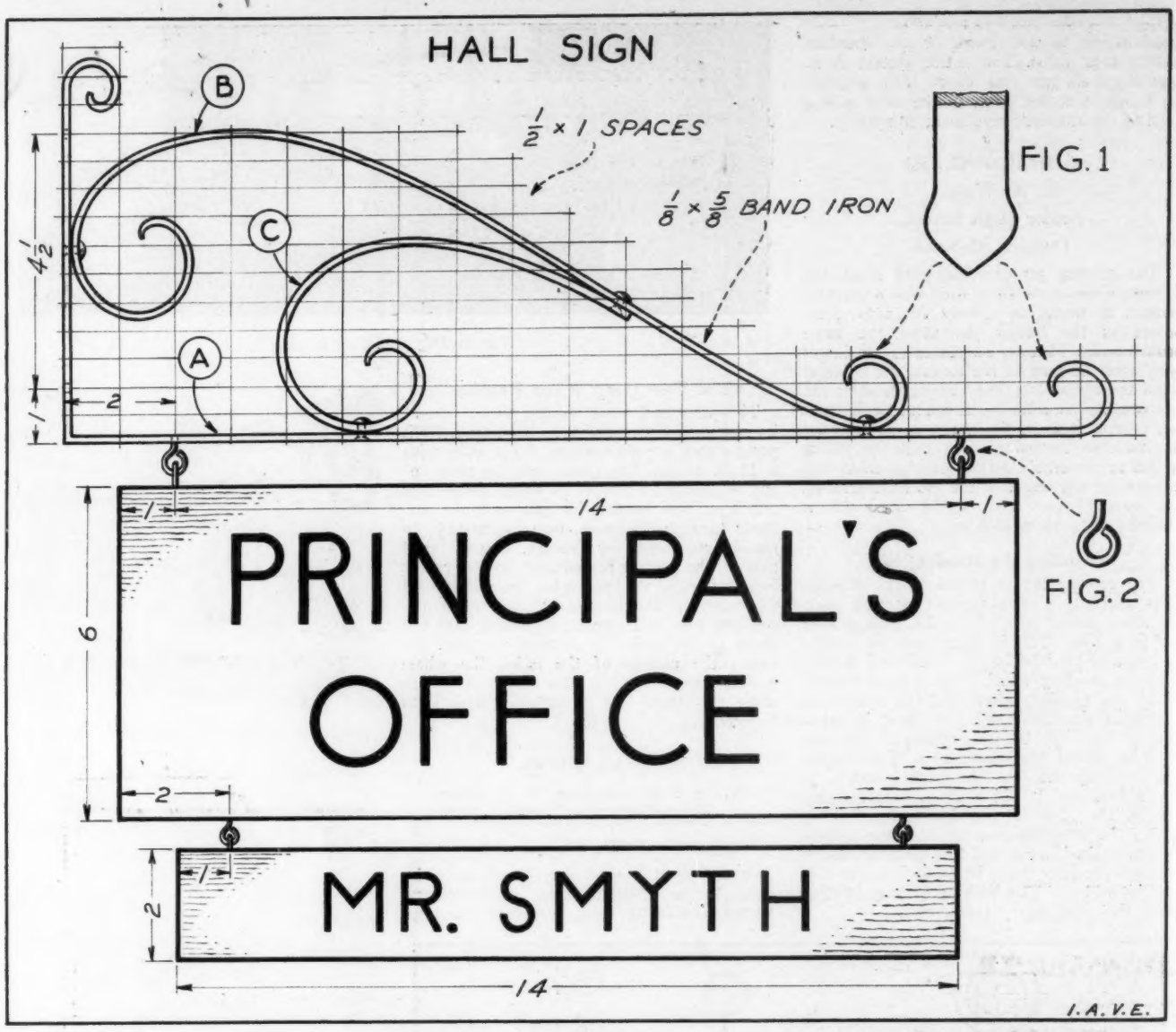
1. Select and cut out rough stock for the larger sign — 6⅛ by 16⅛ in.
2. Select and cut out rough stock for the smaller sign — 2⅛ by 14⅛ in.
3. Square piece for larger sign to finish dimensions, 6 by 16 in.
4. Square piece for smaller sign to finished dimensions, 2 by 14 in.
5. Sand both pieces with 2/0 sandpaper.
6. Stain.
7. Lay out letters for names. Be sure name is balanced on sign.
8. In case a standard color is not used, mix color to be used.
9. Paint on the names.
10. Allow paint to dry thoroughly, then apply coat of shellac to hold color of stain and the painted names.
11. Rub down with steel wool when dry.
12. Apply second or final coat of shellac.
13. Rub down with steel wool.
14. Locate points for screw eyes and screw hooks.
15. Using a 1-in. brad as a drill, drill pilot holes for all screw eyes and hooks. This is done to prevent the plywood from splitting when the screw eyes and hooks are screwed in.
16. Screw in screw eyes and hooks.

The Bracket

This band-iron supporting bracket is of simple design, but displays a well-balanced attractive appearance.



Details of the reeding jig parts



The material used for the entire bracket is ⅛ by ⅝-in. band iron, and the name-panel supporting eyelets at the bottom of the bracket are bent up out of No. 11 galvanized wire.

1. Make a full sized drawing of the design to aid in the forming and assembly of the separate pieces.
2. Determine the length of the pieces *A*, *B*, and *C* by using a small cord or thin wire.
3. Cut off material and grind or file all ends to a semicircular shape, and form as represented in Figure 1.
4. Form each piece to correspond to the full-sized drawing.
5. Place each part in its proper assembly position, and mark location for the rivets. Center punch and drill holes with ⅛-in. twist drill.
6. Locate the two 3/16-in. holes on the short side, and the two ⅛-in. holes on the bottom side of part *A*. Center punch and drill.
7. Assemble parts *A*, *B*, and *C* with ⅛-in. roundhead iron rivets.
8. Form the eyes of No. 11 wire. See Figure 2.
9. Insert the eyes into the ⅛-in. holes on bottom of bracket and clinch.
10. Finish with coat of enamel, or oxidize the metal.

The finished bracket is fastened to the wall with wood screws or toggle bolts, depending upon the wall structure.

APPOINTMENT BOOK

Guy A. Pratt,
Washington High School,
East Chicago, Indiana

This is a project that is especially adaptable to the school print shop where bookbinding is carried on as an adjunct to the regular printing courses. However, it could just as well be executed as a sort of cooperative project between the printing instructor and one in another department in which bookbinding is done. It is imperative that the printing instructor take some part in the production of the appointment book since the sheets of the pads are perforated besides being printed with the days of the week and ruled spaces for notations. The production of the pads, themselves, makes a worth-while printing project.

The appointment book, in its entirety, is composed of a cover with a pocket built into the inside of each of its boards, for an appointment pad, Figure 4, and a scratch pad, Figure 3. Each of these pads contains about 50 sheets of 20-pound, antique finish paper stock. The trimmed size of the pads is 5¼ by 8 in. The sheets are wire stitched together and bound with gummed tape. A strawboard tab is attached to each pad to hold them in place within the cover pockets. The appointment pad is perforated across near the binder, while the scratch pad is perforated along the binder and at two other points equally spaced so as to divide the sheets into three parts.

The cover, Figures 1 and 2, is constructed of two No. 20 boards (about 3/32 in. thick); a single piece of coarse-grained, imitation leather; two sheets of heavy, stiff paper or very thin cardboard for the pockets; a strip of soft paper for a back stiffener; and bookbinder's flexible glue. A good quality of paste may be used in place of glue if the glue is not obtainable. The top cover board is padded with cotton wadding, but ordinary cotton

batting may be used, although it will not make such a good job. Wadding is obtainable from houses dealing in bookbinder's supplies. Padding adds dignity to book covers, but, while it is not too difficult to do, it requires considerably more painstaking than the constructing of covers without padding. If the padding is not too thick, the cover may be easily stamped or otherwise decorated after it is fully constructed. Figure 5 shows a cover of this type illustrative of that part of the appointment book.

Constructing the Cover

Tools required: Paper cutter or card cutter, metal straightedge and rule, keen-edged knife or razor blade, bone folder, 1½-in. flat glue brush or paste brush; one-quart, electric glue pot (if bookbinder's flexible glue is used), scissors.

Materials required: Coarse-grained, imitation leather; two cover boards, 5¾ by 8⅜ in., No. 20 chip board (window sign board of the proper weight will do); two pieces of heavy, stiff paper or very thin cardboard, 5¾ by 7¾ in.; strip of soft paper, ¾ by 8¾ in.; bookbinder's flexible glue or non-warping paste.

Procedure:

1. Cut the two cover boards (a, Fig. 1).
2. Coat one board to be used as the top, with glue and press it down on the wadding or cotton batting, then trim away the waste wadding with the scissors.
3. Cut out a piece of imitation leather 13⅞ by 10⅛ in. On this place the bottom cover board coated evenly on one side with glue. Position this board so that ¾ in. of the leather extends beyond its bottom and right-hand edges and 1 in. beyond its top edge. Rub the leather down securely with a clean, soft cloth.
4. Glue the strip of soft paper for the back stiffener (c, Fig. 1) in its place, 1/16 in. from the bottom cover board.
5. Attach the pocket boards to both cover boards as shown at b, Figure 1. Note that glue is applied to these boards only on the lower area.
6. Coat the turn-in edges of the leather all around with glue and put the padded board in its proper position on the leather. Cut away the corners of the leather as shown in Figure 1, then pull the turn-ins over on the boards with the finger tips. Turn the vertical, or right- and left-hand edges first. Push in the corner ears (f, Fig. 2) with the bone folder, and then turn the bottom and top edges in turn. Rub the turned edges well down with the folder so that the leather will stick fast at all points.
7. Cut the second piece of imitation leather for the lining (e, Fig. 2) 7½ by 12 in. Coat the unfinished side of this generously with glue and put it down on the inside of the cover with its top edge ⅛ in. below the top edges of the pocket boards. Rub it down first along the middle and then

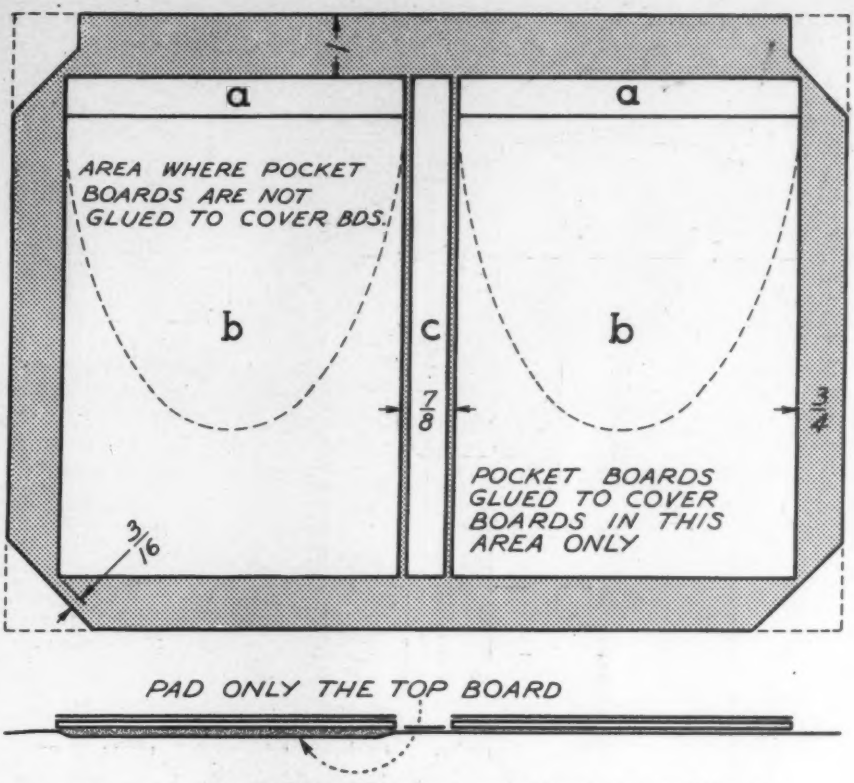


Fig. 1. a, cover boards, 5¾ by 8⅜ in.; b, pocket boards, 5¾ by 7¾ in.; c, paper, back stiffener, ¾ by 8⅜ in.

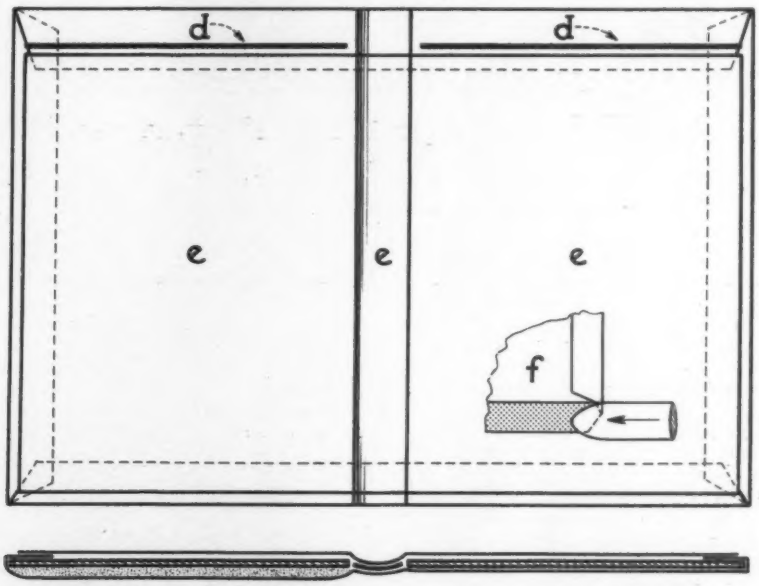


Fig. 2. d, slit to receive pad tab; e, cloth or imitation leather lining; f, pushing in the corner ears

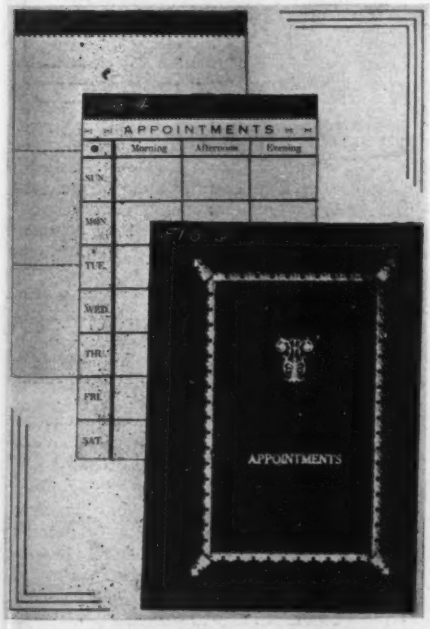
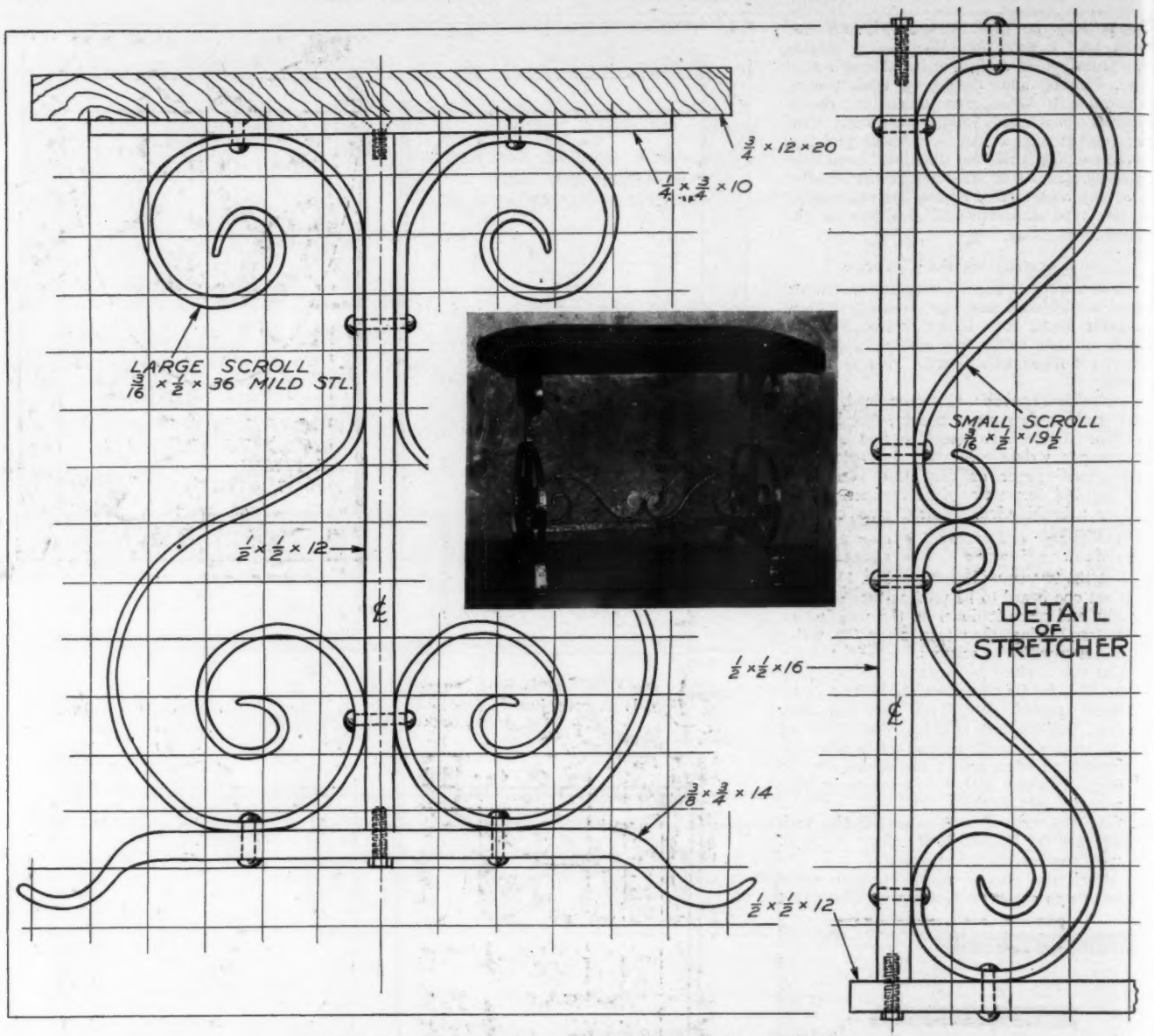


Fig. 3. Scratch pad, 5¼ by 8 in., Fig. 4. Appointment pad, 5¼ by 8 in., Fig. 5. The completed appointment book



Radio bench, submitted by R. A. Tomkiewicz, Milwaukee, Wisconsin

on the boards. Close the boards so that their edges are flush and lay the cover aside until thoroughly set.

8. With a sharp knife or razor blade, and a straightedge, cut slits (d, Fig. 2) along the top edges of the pocket boards long enough only to receive the tabs attached to the appointment and scratch pads.

NOVELTY CASTINGS

H. John Blann,

Northville, New York

There are various ways of casting small novelties in metal. Some of these are frequently banned from the school and home shop because of the difficulty, time required, and expense necessary to carry on these activities. The method of making castings as here described, however, is neither difficult nor expensive. Small articles of extremely fine detail may be reproduced with comparative ease. The operations are similar to the industrial foundry processes and anyone acquainted with common foundry practice and equipment can make and operate a pumice casting unit as herein described.

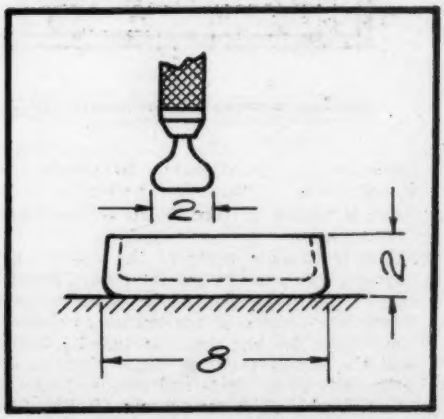


Fig. 1. The hardwood pestle and mortar

The casting compound is mixed from ordinary pumice stone obtainable at almost any hardware store. The equipment may be easily made in the school shop or in the home workshop.

The range covered by this field of casting has few limitations. The beginner may use small ornamental objects obtained from a ten-cent store as patterns. If the worker has some creative instincts, these patterns may be turned on the lathe or modeled in clay.

If a shop has no foundry equipment because of lack of space or money, this outfit may be substituted because the processes may be the same as the industrial foundry work. However the greatest advantages this outfit possesses is the high degree of detail which it is possible to obtain.

Casting Compound

The casting compound consists of a mixture of FFF pumice stone and glycerin. This can be mixed in the mortar and pestle, shown in Figure 1, and made in the shop and rigged up for use on a drill press. Both pestle and mortar

are to be turned up of maple or some other hardwood. It is quite imperative that hardwood be used, because even the hardwood wears away when mixing the pumice stone and glycerin. The proportions of the mixture are about 8 parts of pumice to one part of glycerin. Fill the mortar about one half full of pumice and add the correct amount of glycerin. This may be stirred slightly to allow the pumice to soak up some of the liquid. The mixture will be quite lumpy at first. Now start mixing with the drill press. Keep moving the mortar around bringing the pestle down firmly each time. When the compound is thoroughly mixed, it will tend to break up in waferlike pieces. Also it will hold its shape and not collapse when the pestle is lifted as it did at first. When finished, the entire mixture will be an even color and texture.

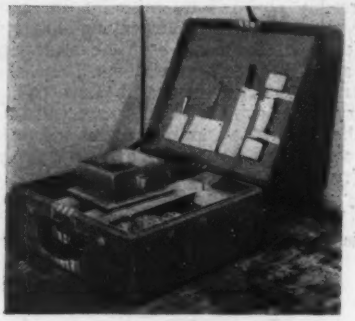


Fig. 2. Traveling case fixed up as a container for the tools and supplies used for this casting unit

1. The unit as shown consists of an outside container which in this case is a so-called overnight case with wooden sides. The inside is lined with either tin plate or galvanized iron. The top is reinforced with a plywood panel to allow for the mounting of the necessary accessories.

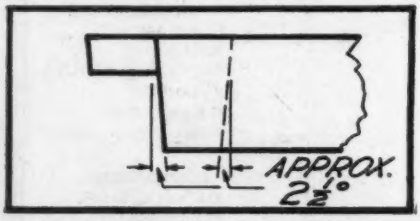


Fig. 3. Detail of block showing draft

The flasks are cast of aluminum, and may be made in the home or school shop. See Figgures 3 and 11. Molding boards are made for the two sizes of the flasks. The rammer is turned up of maple, birch, or some other hardwood, 1½ by 7 in. The rammer is shown at the extreme right on the tool panel in Figure 2. See also Figure 6 which shows how the rammer is used. The next compartment contains the slicks and the strike bar. Figure 7 shows how the strike bar is used. The next pocket in Figure 2 houses the sprue hole cutter, and the brass tubing, shown in Figure 4, through which the casting is poured. The mixed casting compound doesn't show, but about 1½ qts. of the mixture of which 3 lb. of pumice will be required, will be found adequate.

2. The first step in casting is placing the drag of the flask upside down on the molding board. Then place the pattern in the center with the detail up. No riddling is necessary if care is taken of the pumice and foreign particles are not allowed to mix with it. Use the shovel in filling the drag with the pumice mixture.

3. Figure 6 shows how the mold is being rammed. The pumice must be packed quite hard for the best results. Special care must be taken to ram the corners well. After each ramming, the smooth surface of the pumice mixture must be broken up with a slick so that the added pumice will not break away.

4. The next operation is striking, that is, leveling the pumice. See Figure 7. After this has been done the drag is turned over and the cope is added and the operations just described are repeated. When the flask is completely filled, the sprue must be cut with the piece of tubing prepared for that purpose. Be sure when cutting the sprue that it is cut to the right

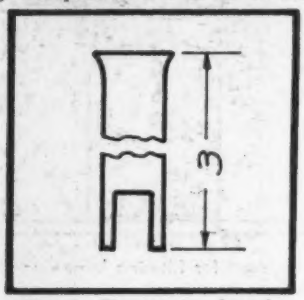


Fig. 4. The pouring funnel

Fig. 5. Filling the flask with the pumice-glycerin mixture. Fig. 6. Ramming the mold

depth. This can be determined by gauging on the outside of the flask with the tubing.

5. The flask is then opened and the gates are cut. No riser is necessary, but air vents of about ½ in. long, as shown in Figure 9, are cut at the corners of the pattern. The gate and the air vents are cut while the pattern is still in the mold. This eliminates the possibility of a slip destroying the face of the mold.

Drawing the pattern from the mold is a simple operation. The pattern is tapped lightly with the slick. When the pattern breaks loose one side will raise slightly. Lay the other molding board on the face of the mold and invert. Lift the mold away from the molding board and if the pattern is broken loose it will remain on the molding board. Be sure that all loose particles are blown away and then reassemble the flask.

Fig. 7. Striking the mold means to smooth the top of the mold. Fig. 8. Cutting the gate. This permits the molten metal to enter the cavity left by the pattern

6. The next step is placing the tubing in the sprue hole. The tubing gives added height to the pouring gate which increases the pressure on the face of the mold. This increased pressure makes for clearer detail and tends to force the air bubbles out. Be sure that the opening at the foot of the tubing faces in the direction of the gates. After the tubing is inserted there will be a little space around it. Pack the pumice tightly about the tubing, otherwise the molten metal will flow back out around the tubing.

7. Now the mold is ready to pour. Pewter seems to be the best metal for casting because of its low melting point, its hardness, and its ability of holding a bright luster. Babbitt metal and type metal which are a little harder than pewter, and which take a very clear impression, may also be used.

After allowing the metal to harden the mold is separated, and the casting trimmed with a jeweler's saw, jeweler's files, a knife, a heavy

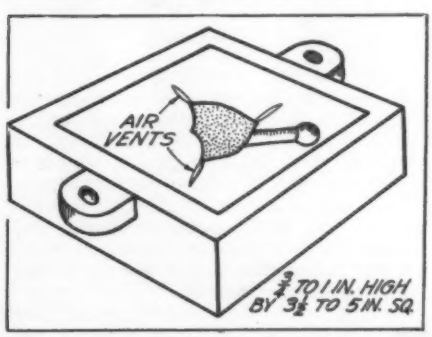


Fig. 9. This shows how the air vents are cut

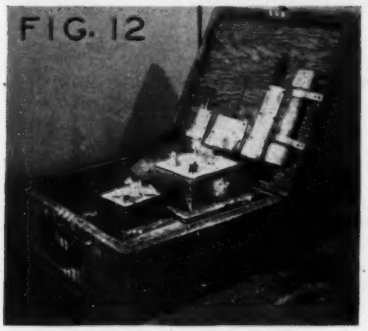


Fig. 10. The mold is now ready for pouring. Fig. 11. Pouring the molten metal into the mold. The dimensions of two different sized flasks also are shown. Fig. 12. Two sizes of flasks

scissors, or with tin snips. The surface of the casting should possess a smooth, satinlike finish. This may be dressed down depending on the job or individual taste. A buffing wheel or a soft rubber eraser will be very useful to brighten the satin finish if so desired.

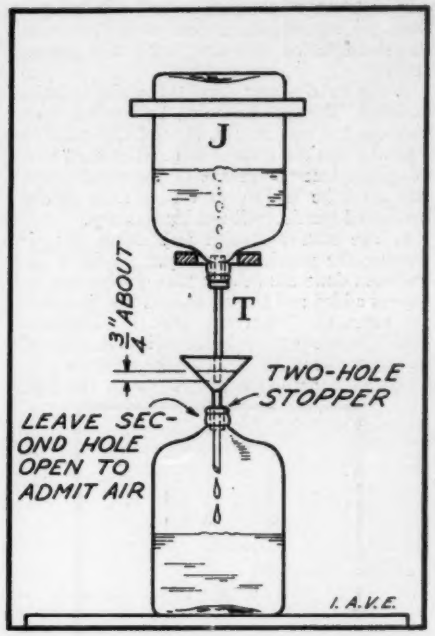
Figure 11 shows two sizes of flasks which may be used for casting a diversified set of projects.

FILTERING LARGE QUANTITIES OF SOLUTIONS

C. J. Schliep,
Xenia, Ohio

In school or home shops, for electroplating, or in science laboratories, it is often necessary to filter large quantities of liquids. A gravity filter using fine-grain filter paper is very slow and since the liquid level in the funnel must be kept below the edge of the filter paper it becomes quite a tedious job to filter several gallons of liquid. Also, because of the small amounts that can be poured into the funnel, it requires constant attention.

A very simple but effective method for making a continuous filter is shown in the diagram. The jar *J* is airtight, and contains the solution to be filtered. Tube *T* extends



Arrangement for filtering large quantities

into the funnel so that its end is about ¾ in. below the top edge of the filter paper. This is to prevent the solution from rising above the edge of the paper. The principle involved is, of course, simple. When the level of the solution in the funnel reaches the end of the tube *T*, no air gets into the jar and atmospheric pressure holds the liquid up in the jar. When the funnel has emptied sufficiently to bring the solution below the end of the tube, air will enter the tube and allow more liquid to run into the funnel. A gallon of copper sulphate solution which required eight hours to filter, required only ten minutes of the operator's attention when this setup was used.

REPLACING LOOSE T-SQUARE HEADS

D. W. Brown,
Public Schools,
Wichita, Kansas

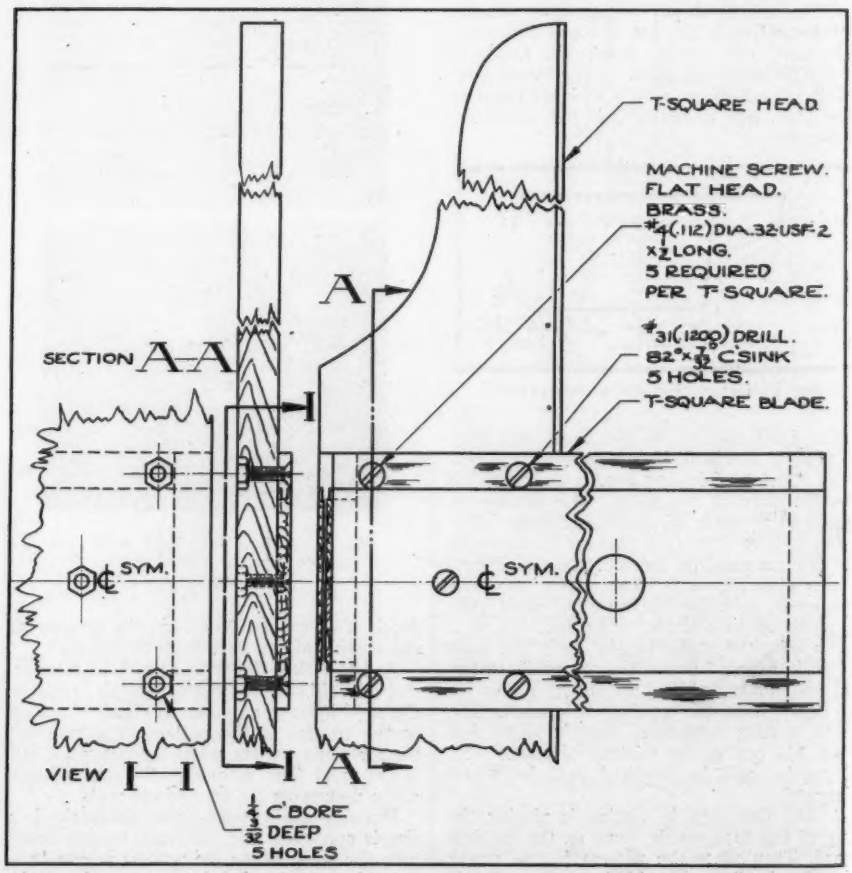
An annoyance for all instructors of drafting are loose T-square heads. This annoyance can be readily obviated by following the procedure pictured in the accompanying illustration.

Nearly all T squares have the blade glued, and secured to the head with small size, short, brass crews. When the head loosens it is necessary to remove the wood screws and scrape off the old glue and apply new glue and replace the screws and wait a day or so for the glue to dry before the T square can be used.

By using the method of repair shown herewith much trouble and labor is avoided, and blade and head are held firmly together without resorting to glue.

Method of Procedure

1. Remove old screws.
2. Scrape off all old glue from T-square blade and head.
3. Drill No. 31 (.1200) holes through blade



Repairing loose heads on T-squares

and head of T square where wood screws were.

4. Countersink holes perviously drilled in blade, to accommodate heads of No. 4 flat-head brass machine screws.

5. Counterbore ¼ in. dia. by 3/32 in. deep holes in head of T square, on side opposite the blade, in hole locations previously established. A ¼ in. auger bit is recommended.

6. Place the chamfered side of the nuts down in the counterbored portion of the holes, and drive or press them into the head until the side of the nut is flush with the surface of the head.

7. Insert and tighten machine screws in place.

A PIN-UP LAMP

N. H. Poole,
Emmerich Manual Training High School,
Indianapolis, Indiana

This modernistic pin-up lamp can be built readily of cold-rolled iron. If power equipment is not available, all of the work can be done with hand tools.

Bill of Materials

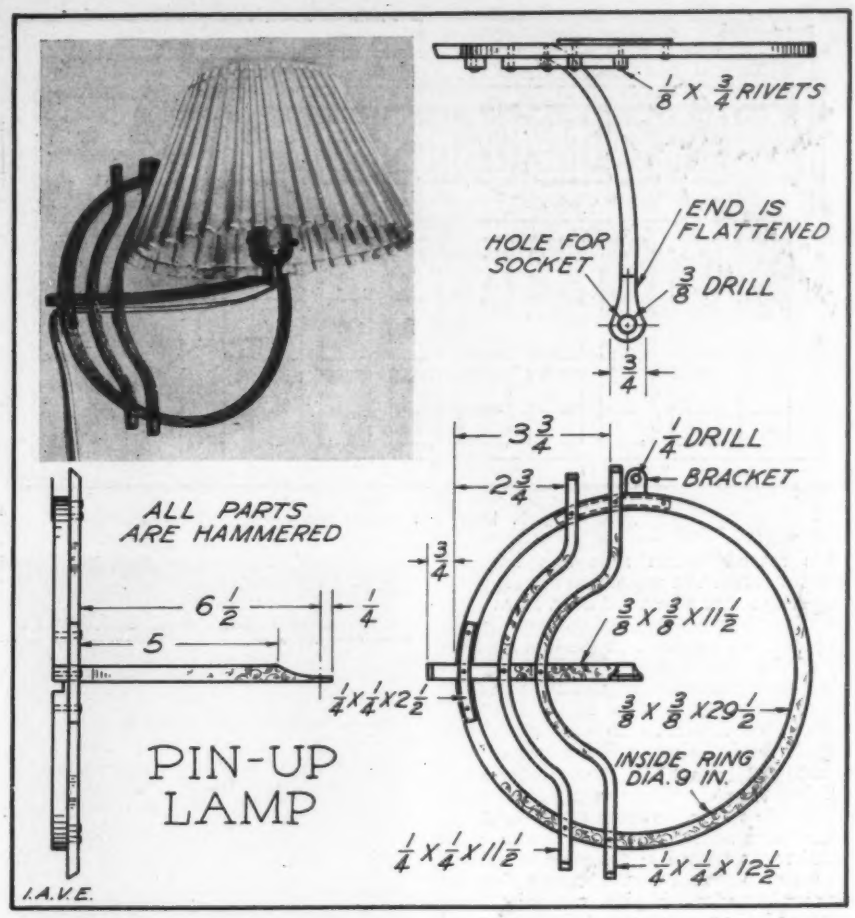
No. Required	*Size*	*Material*	*Item*
1 pc.	⅜" sq. x 29½"	Cold-rolled iron	Ring
1 pc.	⅜" sq. x 11½"	Cold-rolled iron	Bracket
1 pc.	¼" sq. x 12½"	Cold-rolled iron	Long crossbar
1 pc.	¼" sq. x 11½"	Cold-rolled iron	Shorter crossbar
1 pc.	¼" sq. x 2½"	Cold-rolled iron	Center tie
1 pc.	1½" sq. x 2"	Sheet steel, No. 28 gauge	Hanger
10 pc.	⅛" x ¾"	Roundhead, soft iron	rivets
For Wiring		No. 1 and No. 00 emery cloth Clear lacquer	
1		Push-through chromium-plated	electrical socket
1 pc.	⅛" x ¾"	Iron-threaded	pipe
1	⅛"	Pipe lock nut	
	6'	Rayon parallel lamp cord, silver color	
1		Plug cap, black or brown	
1	4" dia. at top, 9" dia. at bottom, 6" deep	Lamp shade	

Tools Required

Scriber, try square with graduated blade, center punch, ball-peen hammer, hacksaw, mill file, round file, vise, anvil, ⅛-in. twist drill, ¼-in. twist drill, ⅜-in. twist drill, breast drill, tin snips.

Methods of Procedure

1. Cut the ⅜-in. square stock to length. Clean off the scale and oxide with No. 1 emery cloth. Continue to polish with No. 00 emery cloth, until the metal has a good polish. Peen three sides of the iron only, as the side of the ring that goes against the wall does not need to be peened. Since the ring is 9 in. in diameter, it is well to have a disk or round article of this diameter to check the ring for roundness. After the iron has been peened it is bent in the vise. Use sheet metal over the vise jaws to prevent jaw marks. Open the vise slightly larger than ⅜ in. Insert one end of the iron between the jaws and make a slight bend. Move the iron up about 1 in., and make another slight bend. Continue bending in this manner until the rough-shaped ring has been formed. Make the ring into a perfect circle by shaping it to a 9 in. diameter disk. Saw off any excess metal.



2. Clean and peen the piece for the lamp bracket. Bend it so that it forms a quarter circle. Flatten and drill one end for the ⅛-in. pipe, using a ⅜-in. drill.

3. Clean and peen the two ¼-in. square pieces that make the decorative crosspieces of the lamp. Shape these pieces in the vise, making sure that one duplicates the other. File the ends oval in shape.

4. Lay out and drill the ⅛-in. holes according to the drawing. It is a good plan at first to assemble each part with ⅛ by 1-in. stove bolts. After all parts have been drilled and assembled, the stove bolts are removed, and the parts are riveted.

5. Clean and peen the ¼ by ¼ by 2½-in. piece of iron which is used to tie the ring together where the ends meet. Bend a curve in this short piece to coincide with the curve in the ring. File the ends oval in shape. Drill three ⅛-in. holes in this piece as shown in the drawing. Assemble and rivet in place.

6. Lay off, peen, and cut out the sheet steel piece which is used for the hanger. Drill a ¼-in. hole in the eye so that the lamp, when in use, can be hung over a rather large nail.

7. File a groove in the back of the ring so that the electrical cord will fit in the groove, and not hold the lamp out from the wall.

8. Give the lamp a coat of clear lacquer.

9. Wire the lamp according to the Underwriter's Code.

WHY USE WOOD FILLER

Arthur W. Bauer,
State Teachers College,
California, Pennsylvania

It is quite difficult to find illustrative material that clearly shows why different methods of finishing are used. There is a reasonable amount of material available on wood finishing, but very little actually pictures the results obtained or shows why certain steps must be used depending upon the type of wood being finished.

The teaching aid described herein, consists of a long electrically lighted box fitted with several lantern slides. See Figures 1 and 2. Each lantern slide is made up of two thin wood shavings mounted between two pieces of clear glass. The lights behind the slides bring out more clearly the arrangement of the pores and the grain of the specimen.

The first slide on the left side of the box has two thin shavings of black walnut. The upper half of this slide has a shaving cut tangent to the annual rings and in the lower half the shaving is a radial cut. The light behind the slide shows up the pores or openings that must be filled in order to obtain a smooth finished surface.

On the baseboard in front of the box, the first sample of wood is black walnut properly filled, shellacked, and varnished. The upper half of this sample has been stained and the lower half was given a natural finish. On the card in front of the sample is printed the finishing procedure with the number of coats of each finish.

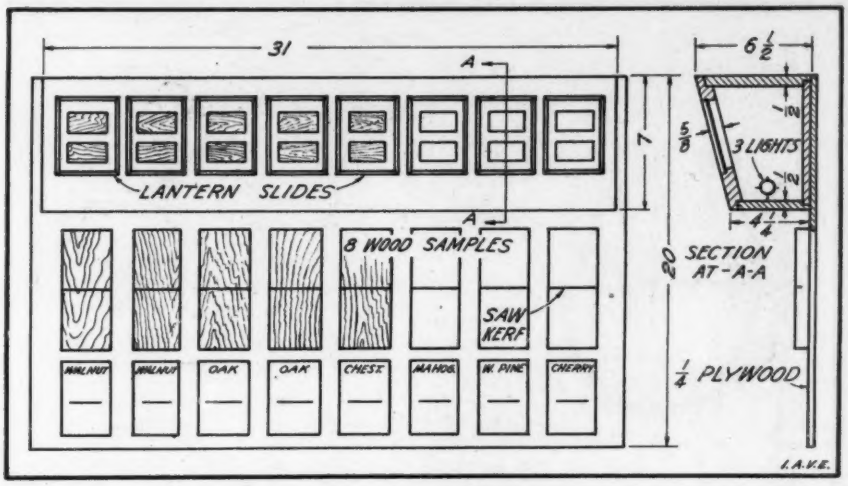


Fig. 1. Details of display board

The second lantern slide also has two walnut shavings. The top section has the pores completely sealed with wood filler. Light from the inside of the box does not show up through the pores. See Figure 2. In the lower section the shaving was carelessly filled. Notice the light showing through many of the pores not sealed. The sample of wood on the baseboard in front of this slide has its upper half properly filled, the surface being smooth with all the pores completely filled. If the lower half is improperly filled, many of the pores will still be visible, leaving a rough surface.

The third and fourth slides contain white oak shavings treated in the same manner as the first two walnut ones. The fifth slide has chestnut samples showing especially large pores and their arrangement in the annual rings. The sixth slide illustrates a sample of diffused porous wood in a piece of mahogany. The last two slides have shavings of white pine and cherry illustrating the texture of nonporous wood. Here it is possible to see why these woods are not filled in the same manner as some of the others.

With these same slides it is possible to illustrate how an open grain finish may be secured, and why some woods lend themselves better to this type of finish than others. This device can be used to explain the two-toned effect to be found on some of today's kitchen furniture. The box can easily be adapted to illustrate many procedures or methods of finishing and wood structure by simply changing the slides.

Fig. 3. Shavings cut from properly and improperly filled black walnut. Notice the light coming through the improperly filled pores.

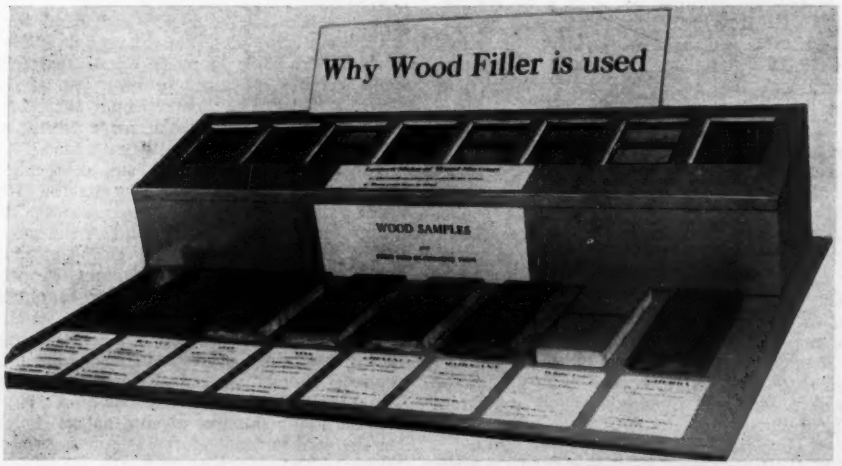


Fig. 2. The electrified display board used in teaching wood finishing

Better results will be obtained if some of the following suggestions are considered in constructing the box. The thin shavings must be cut with a sharp jack plane and should be a little larger than the opening in the mask. This will allow the shaving to be glued to the back of the mask. This also holds the shaving in position while the glass slides are assembled. The mask is made of opaque construction paper and is used so the light will be seen only through the shaving. In order to diffuse the light and cut down the amount of light, a long sheet of white drawing paper may be fastened to the underside of the lid containing the slides. The inside of the box should be painted with aluminum paint to further diffuse the light. Only low-wattage bulbs are used because very little light is needed. Placing the bulbs as far back as possible, under the wide portion of the lid, helps distribute the light more evenly. If desired, the lid of the box may be made so the slides are removable. This will enable other types of wood samples to be studied. The same box could be used with other lids. With this versatile arrangement many slides could be used and the device could be made to suit almost any condition.

SIX UNIT HOT-DOG ROASTER

C. T. Van Wie,
McKinley Intermediate School,
Schenectady, New York

The hot-dog roaster illustrated and described herewith is a very popular project. It embodies metalwork, woodwork, and electric work. It can be made readily by a beginner, and it is a constant cause of amusement when it is in operation. The total current consumed is not above one ampere when the six standards are in operation at once. It should not take over one minute to cook the wieners.

It is well to plate the prongs with chromium to prevent them from pitting.

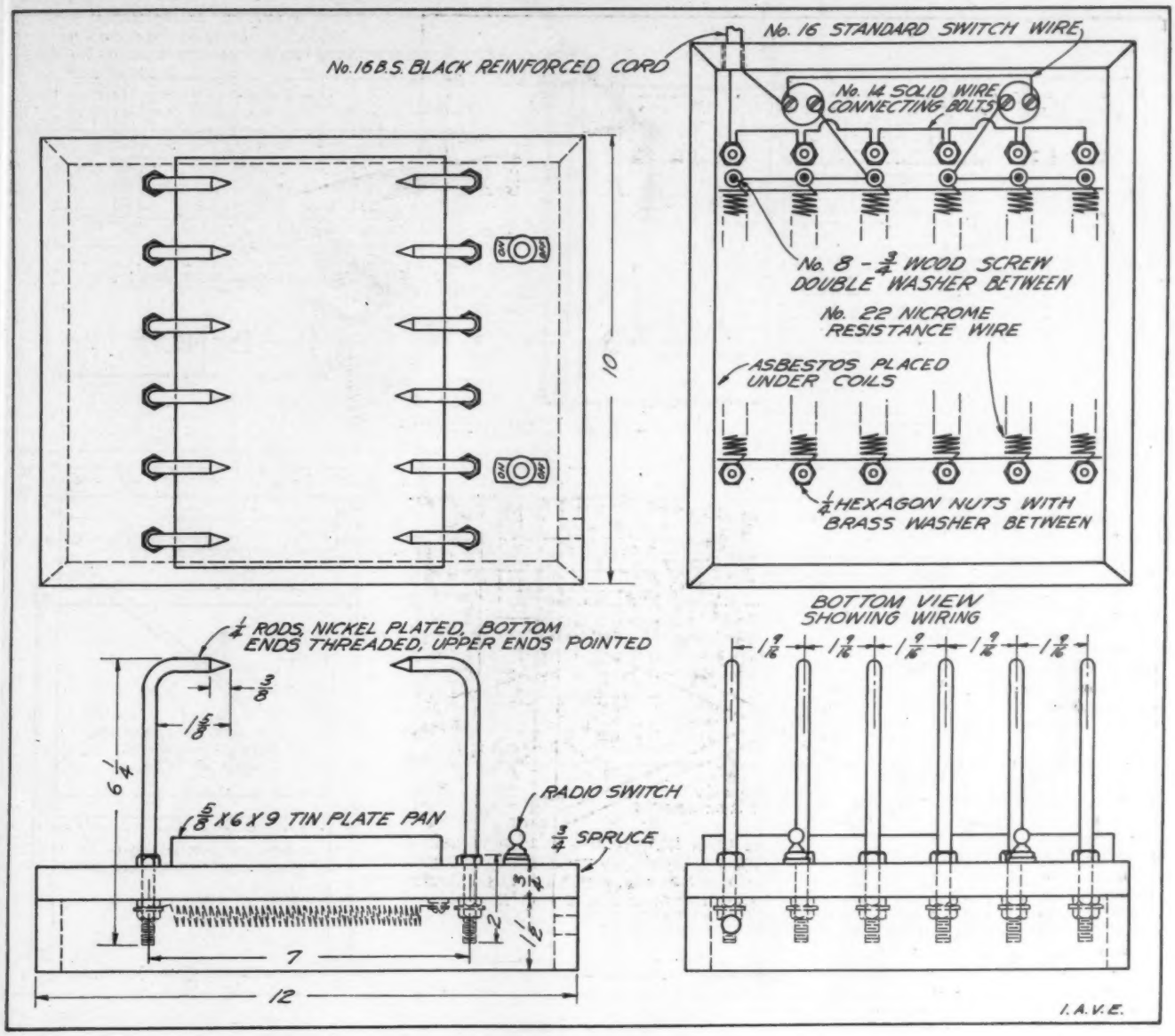
The roaster is to be used with a.c. electricity only.

Bill of Materials

No. Required	*Size*	*Material*
8 ft.	¼"	Cold-rolled steel or iron rod
36	¼"	Hex nuts
1 pc.	8" x 11"	Bright tin, 28 gauge
2		Small tumbler switches, 3 or 5 amperes
1	¾" x 12" x 20"	Soft pine board
3 ft.	No. 14	Solid wire
8 ft.	No. 18	Black reinforced cord
1		Attachment plug
6	½"	No. 6 roundhead blued wood screws
12		Brass washers
1 ft.		No. 22 Nichrome wire
6	¾"	Brass washers

Method of Procedure

1. Cut board to 10 by 12-in. size.
2. Cut remainder of board to four pieces, 1⅝ by 10 in.
3. Miter to 45 degrees all four pieces and nail to bottom of large board so that mitered pieces will fit close together. A little glue on the mitered ends will make a solid job.
4. Lay out 12 holes on top of the board



Details of six unit hot-dog roaster

as shown in the working drawing. Drill holes with a ¼-in. auger bit.

5. Lay out 2 holes for switches as shown. Drill two holes through, then counterbore with a 1-in. bit from the bottom to within ¼ in. of the top.

6. Cut 12 pieces of ¼-in. cold-rolled steel or iron rod 8 in. long.

7. Grind down one end to a fine point and about ½ in. back.

8. Bend sharpened end about 1½ in. back from tip or point to 90 deg.

9. Thread other end for a length of 2 in.

10. Screw nut on each standard and place in each individual hole on top of board.

11. Screw nut on each standard on under side of board and tighten to a snug fit.

12. The third nut is for the wiring.

13. Place switches in hole and tighten down with lock nut.

14. Make a drip pan 6 by 9 by ⅝ in. high.

15. Place drip pan between standards, center, and fasten to board with ½-in. No. 6 r.h. screws.

16. Wind a solid coil, 12 in. long, of No. 22 Nichrome wire around a ⅜-in. iron rod or core. Cut this coil into 6 pieces 2 in. long each, and stretch from bottom of one standard to wood screw just opposite as shown in the wiring diagram. Loop ends of Nichrome wire coil around standard and wood screw.

17. Install wiring as shown.

18. A piece of reinforced extension cord, 8 ft. long with an attachment plug cap can be used as the lead wire.

WORKBENCH

D. E. Ferguson and Thomas Jungck,
Horace Mann Junior High School,
West Allis, Wisconsin

This bench was designed to fill the need for an economical and suitable workbench in the home workshop. One of the features of this bench is that it can be taken apart easily for transportation purposes.

The frame work of the bench is made of old metal bed rails which are easy to obtain. Stock angle iron can be substituted for the bed rails if desired. The framework may be either riveted or welded together.

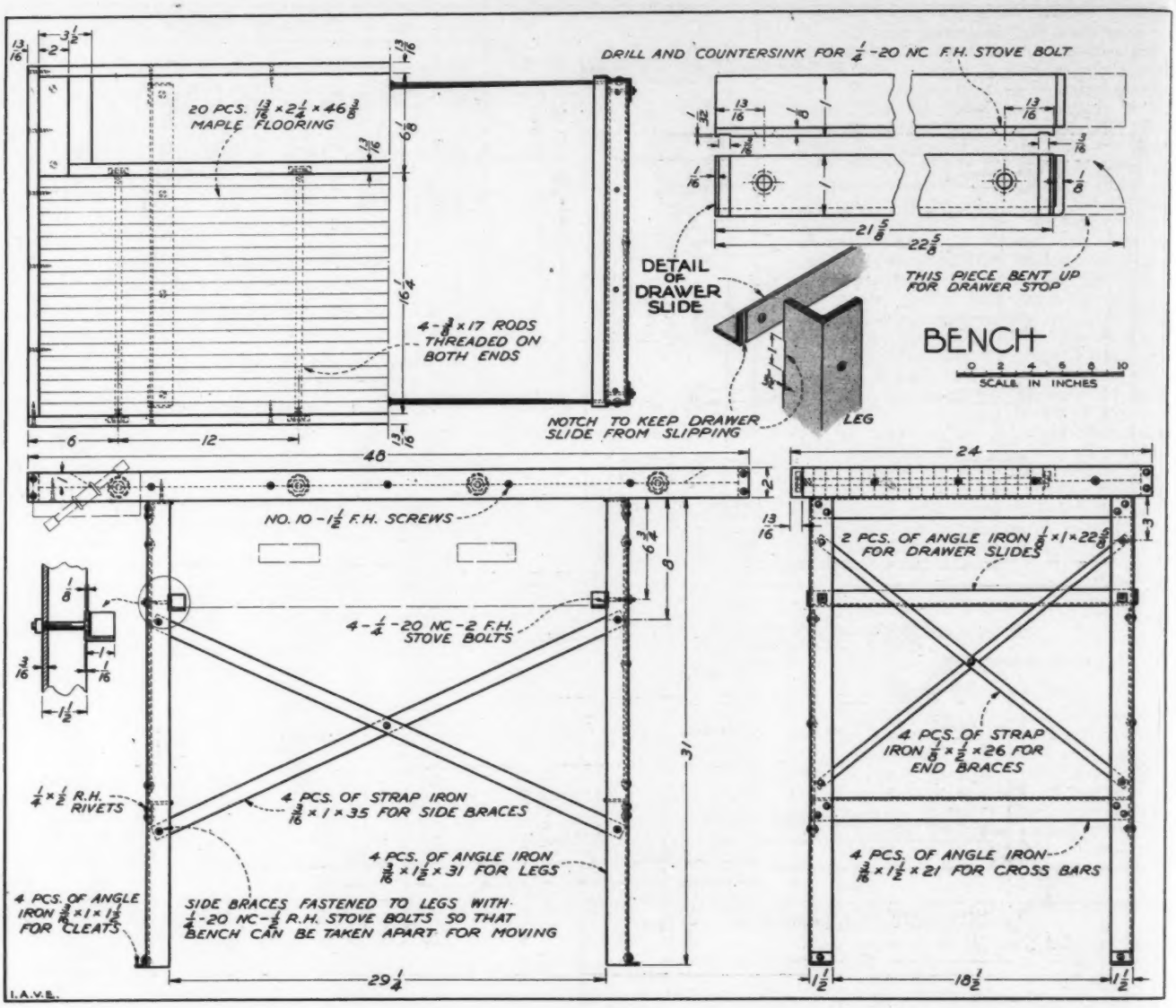
The heavy portion of the top is made of salvaged 2¼-in. flooring set on edge and bolted together with four bolts. The tray is made of any 13/16-in. lumber.

Construction of Framework

1. Cut all parts as indicated on working drawing.
2. Cut notches for drawer slides in rails as shown in detail.
3. Drill all necessary holes.
4. Construct the ends.
   a) Rivet or weld end rails to legs, making sure that rails are at right angles to legs.
   b) Bolt or weld drawer slides to legs.
   c) Rivet or weld end braces to legs.
5. Rivet floor cleats to legs if desired. These are used only when the bench is to be fastened to the floor.
6. Assemble frame by bolting side braces in place.

Construction of Top

1. Body of top is constructed of 19 strips of


20 PCS. 13/16 × 2 1/4 × 46 3/8 MAPLE FLOORING
4 - 3/8 × 17 RODS THREADED ON BOTH ENDS
DRILL AND COUNTERSINK FOR 1/4 - 20 NC F.H. STOVE BOLT
THIS PIECE BENT UP FOR DRAWER STOP
DETAIL OF DRAWER SLIDE
NOTCH TO KEEP DRAWER SLIDE FROM SLIPPING
LEG
BENCH
SCALE IN INCHES
NO. 10 - 1 1/2 F.H. SCREWS
4 - 1/4 - 20 NC - 2 F.H. STOVE BOLTS
2 PCS. OF ANGLE IRON 1/8 × 1 × 22 5/8 FOR DRAWER SLIDES
4 PCS. OF STRAP IRON 1/8 × 1/2 × 26 FOR END BRACES
1/4 × 1/2 R.H. RIVETS
4 PCS. OF STRAP IRON 3/16 × 1 × 35 FOR SIDE BRACES
4 PCS. OF ANGLE IRON 3/16 × 1 1/2 × 31 FOR LEGS
4 PCS. OF ANGLE IRON 3/16 × 1 1/2 × 21 FOR CROSS BARS
4 PCS. OF ANGLE IRON 3/16 × 1 × 1 1/2 FOR CLEATS
SIDE BRACES FASTENED TO LEGS WITH 1/4 - 20 NC - 1/2 R.H. STOVE BOLTS SO THAT BENCH CAN BE TAKEN APART FOR MOVING
I.A.V.E.

Details of workbench

flooring, 52 in. long, and bolted together with four bolts as indicated. Have all groove sides of the strips facing the same direction.

2. Saw ends square leaving top 50½ in. long.
3. Plane tongue side just enough so that top will rest evenly on frame work.
4. Surface groove side to make a smooth and even top.
5. Tray is cut to size indicated on working drawing.
6. Cut end blocks and fasten to tray.
7. Cut end and side rails and fasten into place with screws. Fasten top to frame work with ¼ by 1-in. lag screws. Provision is made for a drawer, 7 by 29 by 21¼ in. This is to be made according to standard drawer construction.

HANGING WALL CHINA CABINET

Franklin H. Gottshall

Martha Berry College

Mt. Berry, Georgia

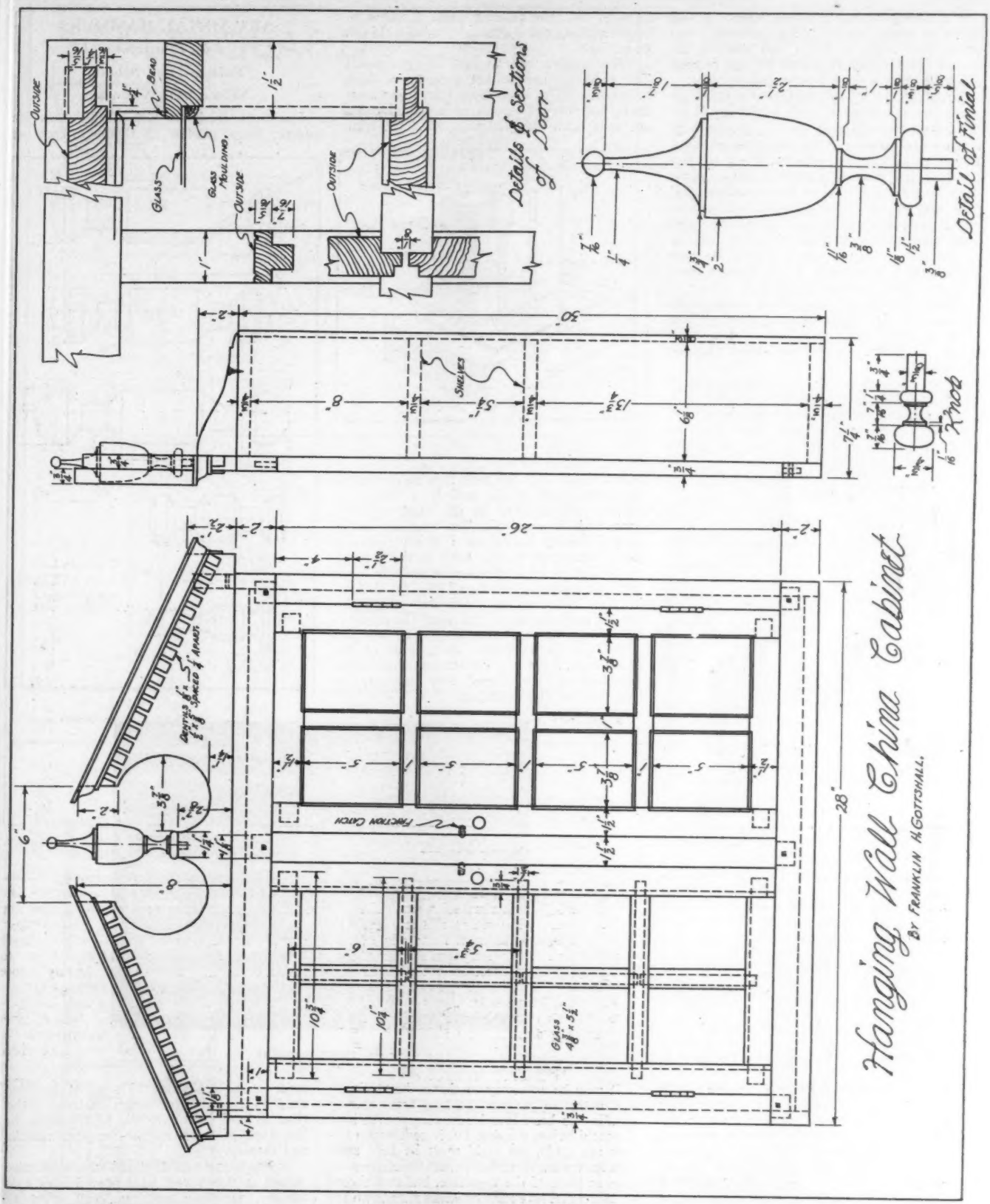
The intriguing little wall cabinet, shown in the photograph, was designed to hold a tea set, used when entertaining afternoon guests, or a small party at bridge. It is ideal for the purpose, being just large enough to hold the few pieces of china required for this purpose. Besides serving a useful purpose, it constitutes a very welcome and interesting addition to the other dining-room furniture, adding a note of hospitality which guests always appreciate.

Casting in copper mold

The design of this small cabinet has purposely been kept quite simple, in accord with the function it is to serve. This makes it an ideal project for the home or school shop. Even the doors, which are the most difficult parts of the project to build, are easily within the scope of the equipment and ability to be found in the average home workshop.

The cabinet itself is little more than a box, nailed together with finish nails. It may be made of white pine, or poplar.

The pediment effect is gained by a face board fastened to the cabinet by means of two wooden brackets. This face board is formed with a break in the center, and appropriately ornamented with molding, dentils, and a classic urn finial. Little difficulty will be experienced in building the pediment excepting at one point — the fitting of the



short return moldings in the break and at the ends of the board. The short pieces in the break of the pediment will be wider than the molding on the face of the board, while the pieces at the ends will be narrower. The author, in building the piece, fitted blocks of wood to these places and then carved them to fit. The miters at the corners are what are commonly known as compound miters; that is, the face molding must be held at the angle at which it is fastened to the board when the forty-five degree angle is being cut to make the joint. Fitting these moldings properly, will constitute an important lesson in advance cabinetmaking.

The facing of the cabinet, which is the frame to which the doors are fastened, comprises five strips, mortised and tenoned together. This frame is nailed to the cabinet after the shelves have been nailed in place.

To build the doors, rabbet the strips as shown on the drawing. This rabbeting is indicated on the left-hand door on the drawing, and on the detail showing the cross sections. Lay out and cut the mortises. Then lay out and cut the haunched tenons. These joints must be carefully fitted to insure success, and this will be the most difficult part of the entire task. With proper setups of the dado head and mortising machine, this will be comparatively easy. If the job must be done entirely with hand tools, it will require more time and some painstaking work.

When the door frames have been made, the beading is carved around each opening with a wood carver's V tool and a skew chisel, as shown on the right-hand door on the drawing.

The glass is fastened by means of quarter-round molding and small brads.

After fastening the hinges the cabinet may be given two coats of flat white or ivory paint, followed by as many more of enamel.

MAKING CASTINGS FOR MEDALS

W. J. Murphy,

Brewster, Minnesota

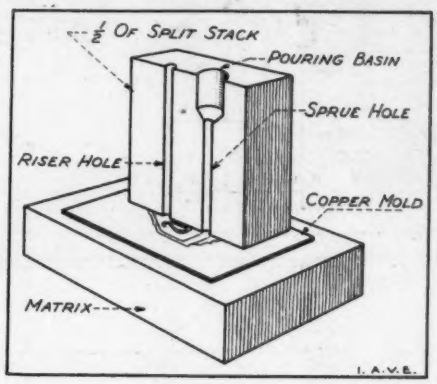
The casting of award medals for extracurricular activities and the like, requires much more detail than ordinary casting methods can give, unless a very fine sand is used. Even then, great difficulty is encountered with the sand sticking, and pulling out in the finer details, such as the lettering. The molds must be remade each time and do not stand up as well under pressure. Recently we have developed a copper mold and a method of casting using pressure. The molds are good for an indefinite number of castings.

The molds are developed by placing the medals backside down on the anvil, and covering with a small piece of sheet copper. The gauge depends upon the amount of relief necessary and the number of times the mold is to be used. The lighter gauges bring out much more detail, but care must be taken that a sheering action does not develop holes. Using a piece of hard maple and a heavy sledge, the copper is swedged down over the original pattern. It is necessary to anneal the copper quite often in the swedging process. When greater relief is desired in lettering and figures, they may be touched up with fine punches. A great deal of labor and touching up of the cast medals is saved through this type of forming around the edges of the medal. The surface corner on the mold must be square so that it will not leave a surplus on the medal when cast. The mold should fit the pattern so tightly that it will have to be tapped on the anvil to remove it.

Backing up the mold with a wooden matrix is very helpful and saves the mold a great deal. This is done by taking the pattern in the mold and backing it with a piece of softwood. By placing this in a vise and applying pressure where needed, a very good matrix can be formed.

In casting the medal, a split wooden stack is used in place of a cope flask. The stack is made by clamping two 1-in. pieces together, and squaring off both ends, leaving a 4-in. stack. The holes for both sprue and riser are made by drilling between the two boards with a ¼-in. bit. The pouring basin is made by countersinking the sprue hole, using a ½- or ⅝-in. bit.

These medals can be cast of type metal. The metal should be hot enough to nicely brown newspaper when dipped into the molten mass, but not hot enough to burn it. Holding the split stack over the open mold the sprue



hole is filled until the riser hole runs over. A vegetable, such as the half of a potato, is quickly pressed down by the hand over the sprue and the riser hole. The moisture in the potato quickly builds up a steam pressure, which brings out the fine relief in this type of mold. The medal is then cooled and the sprue and riser spur clipped off and filed flat. If care is taken in making the mold there will be no surplus requiring extra trimming. The medal is then ready to be electroplated. The unit described in the February, 1937, issue of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine has been found very practical for this type of electroplating.

It may be necessary to clamp the stacks to the matrix to prevent the lead from leaking out. It has been found advantageous to heat the mold before pouring, but if continued castings are made, the mold must be kept sufficiently warm. A moist paper towel may be used in place of the vegetable, but care should be taken that no excess moisture runs down the stack or into the mold as this causes the lead to pop and fly when it hits the water in the next pouring. Medals cooled in water must never be placed in molten lead because the flying lead is very dangerous.

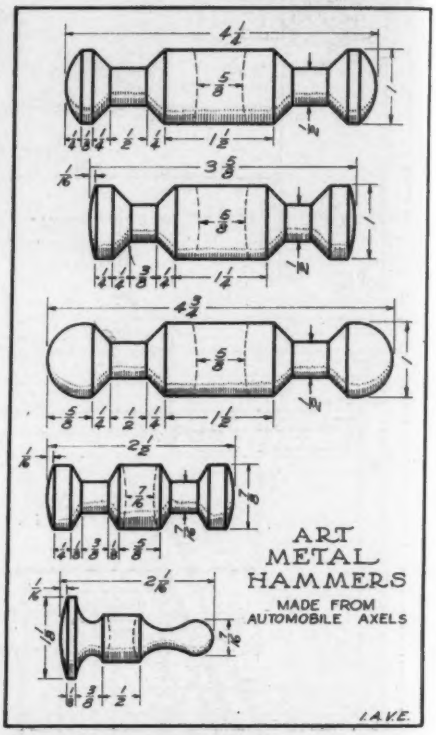
ART METAL HAMMERS

C. Knutson,

Pulaski High School,

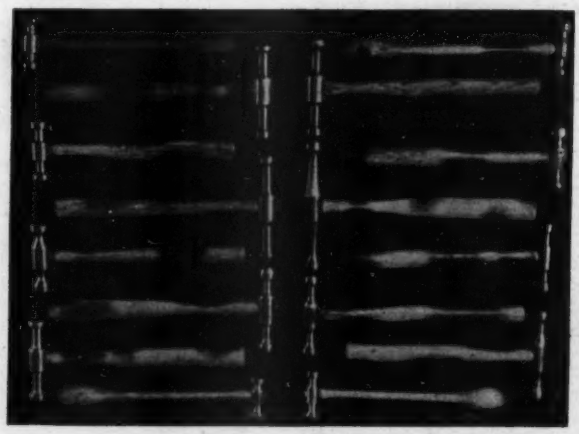
Milwaukee, Wisconsin

Hammers used for art metal work on copper, brass, pewter, or aluminum may be made at a small cost. Art metal hammers need to be made of tough material rather than a hard brittle metal, as hammers for this type of work require frequent refacing and shaping.

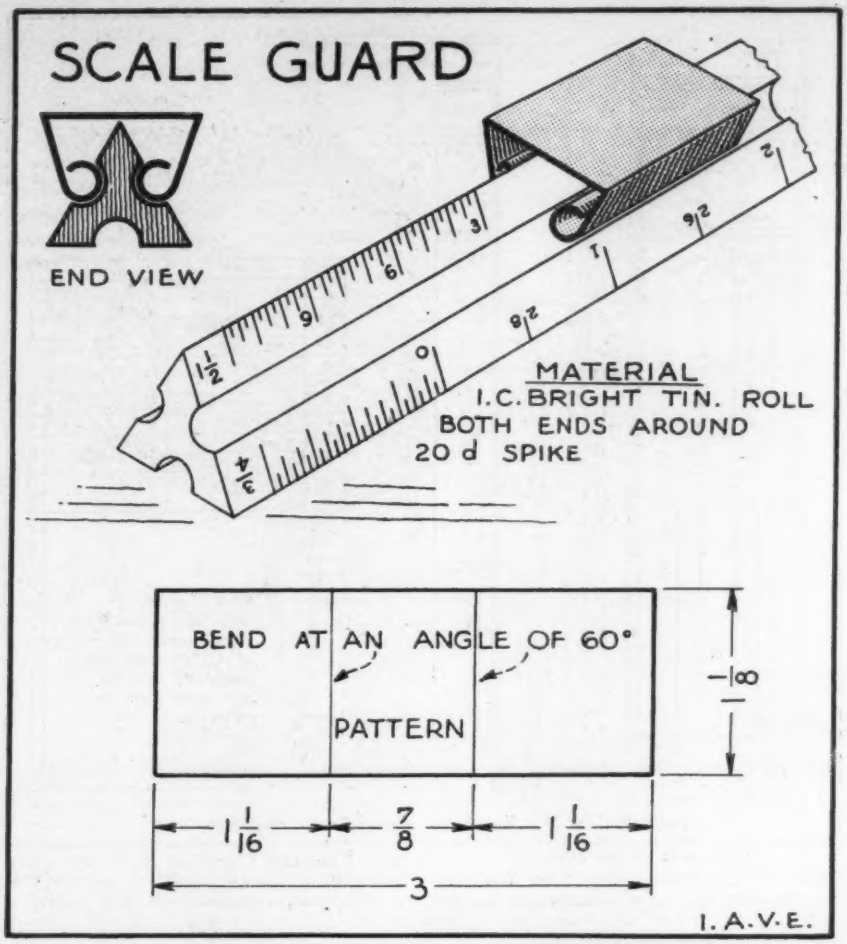


It has been found that old auto axles when turned at slow speed, have proved very satisfactory, for they work up well when cut with a sharp tool.

The hole for the handle must also be drilled at a low speed. The hole should be filed, tapered, and elongated instead of remaining perfectly straight and round.



Art metal hammers



Scale Guard, submitted by Arthur F. Schuster, South Junior High School, Niagara Falls, N. Y.

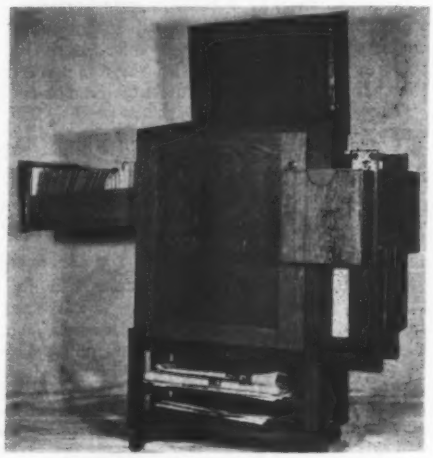
A PORTABLE DESK

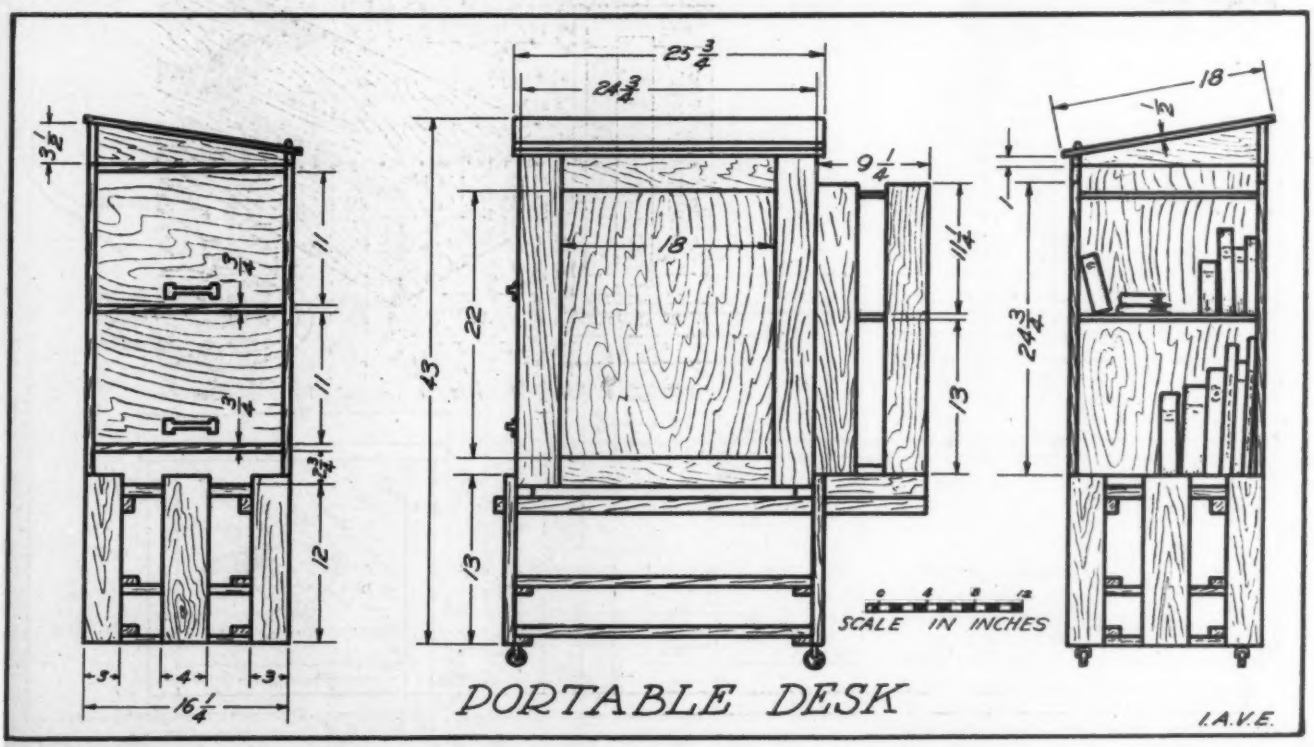
Maurice J. Nelson,
Mankato, Minnesota

As an instructor in industrial education, I have often felt the need of a portable desk that could be used to carry books, class records, filing cases for students' work materials, paper, sandpaper, and other small necessities directly to the shop floor, as well as to provide a place to hang instruction charts and display materials.

With the depression came larger and more frequent classes which precipitated the invention of the portable desk described herewith.

As the illustration indicates, a two-drawer 9 by 12 in. filing cabinet makes up the body of the vehicle. An elevated, hinged top arrangement is fastened to the top of the cabinet and the entire upper part is mounted on a frame work to raise it up to 46 in. on the low side.





Bookshelves are fastened on the end opposite the files and the more frequently used shop books are always close at hand.

The casters at one end are stationary while at the other end they are swiveled, thus making it easy to control while moving through doorways and other narrow places.

A CONTACT PRINTER FOR THE AMATEUR PHOTOGRAPHER

W. E. Giffin,

Township High School,

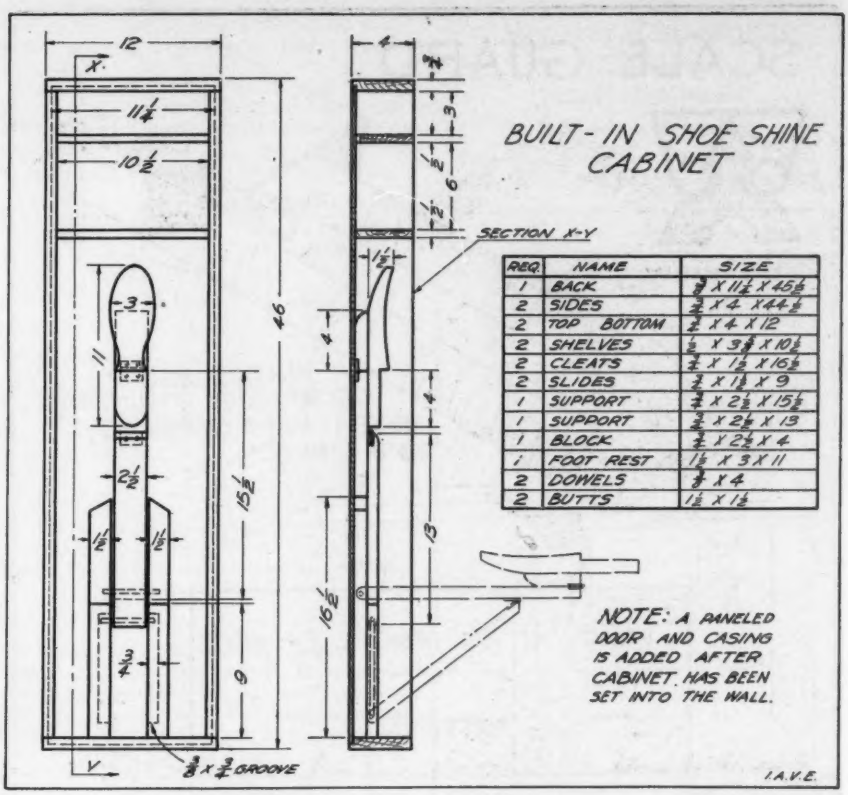
Waukegan, Illinois

The simple printer described herewith was designed and constructed by a camera fan in one of my woodworking classes. Its simplicity of construction, operation, and efficiency have since appealed to others. Much of it was made of salvaged and scrap pieces of lumber.

An old toaster cord already equipped with a two-way switch, a 5 by 6-in. printing frame which cost 45 cents, a light socket at 9 cents, a 60-watt bulb at 15 cents, and two pairs of surface hinges at 16 cents completed the material needed for finishing the project.

The cover consists of three pieces. The narrow piece to which the hinges are attached, is fastened to the sides of the box with flathead screws. The inside of the box is finished with a coat of flat white paint and a coat of white gloss. A piece of window glass etched with carborundum powder helps to diffuse the light.

Anyone interested in photography will find this printer easy and inexpensive to construct in his own shop at home. Printing his own pictures will add a great deal of interest to his work in picturemaking and he will find it cheaper than the usual commercial rate.

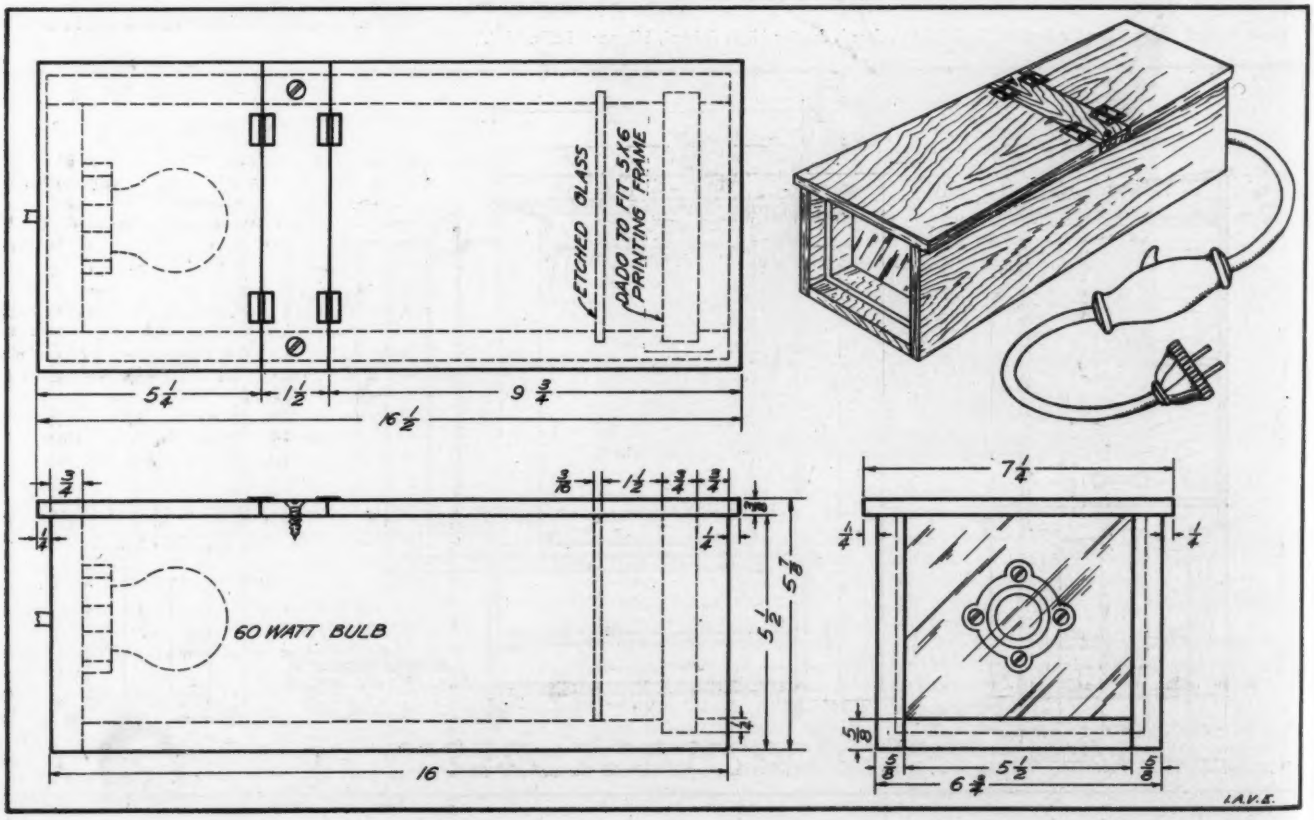

BUILT-IN SHOE SHINE CABINET
SECTION X-Y
NOTE: A PANELED DOOR AND CASING IS ADDED AFTER CABINET HAS BEEN SET INTO THE WALL.
I.A.V.E.

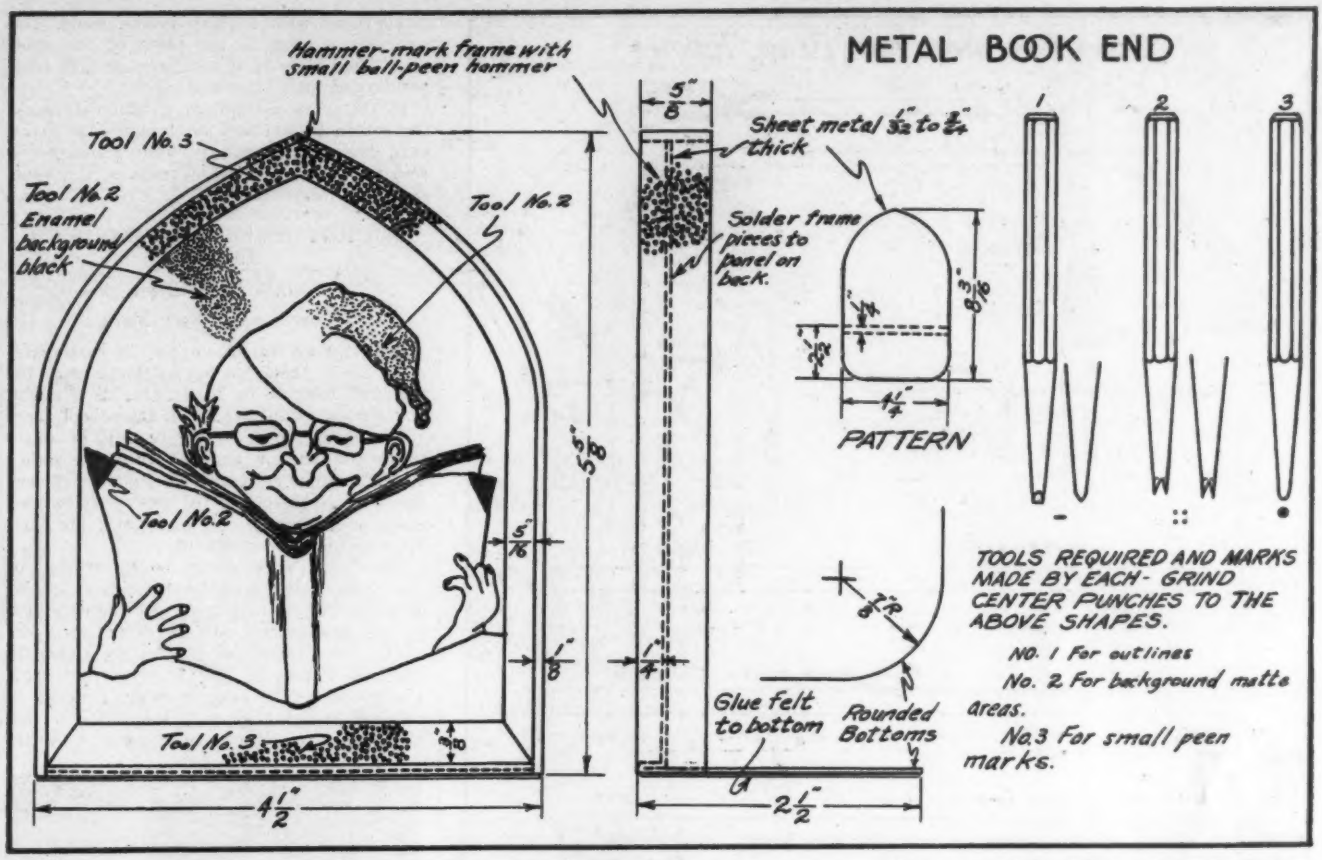
REQ.	NAME	SIZE
1	BACK	$\frac{3}{8}$ X 11½ X 45½
2	SIDES	$\frac{3}{4}$ X 4 X 44½
2	TOP BOTTOM	$\frac{3}{4}$ X 4 X 12
2	SHELVES	$\frac{1}{2}$ X 3¾ X 10½
2	CLEATS	$\frac{3}{4}$ X 1½ X 16½
2	SLIDES	$\frac{3}{4}$ X 1½ X 9
1	SUPPORT	$\frac{3}{4}$ X 2½ X 15½
1	SUPPORT	$\frac{3}{4}$ X 2½ X 13
1	BLOCK	$\frac{3}{4}$ X 2½ X 4
1	FOOT REST	1½ X 3 X 11
2	DOWELS	$\frac{3}{8}$ X 4
2	BUTTS	1½ X 1½

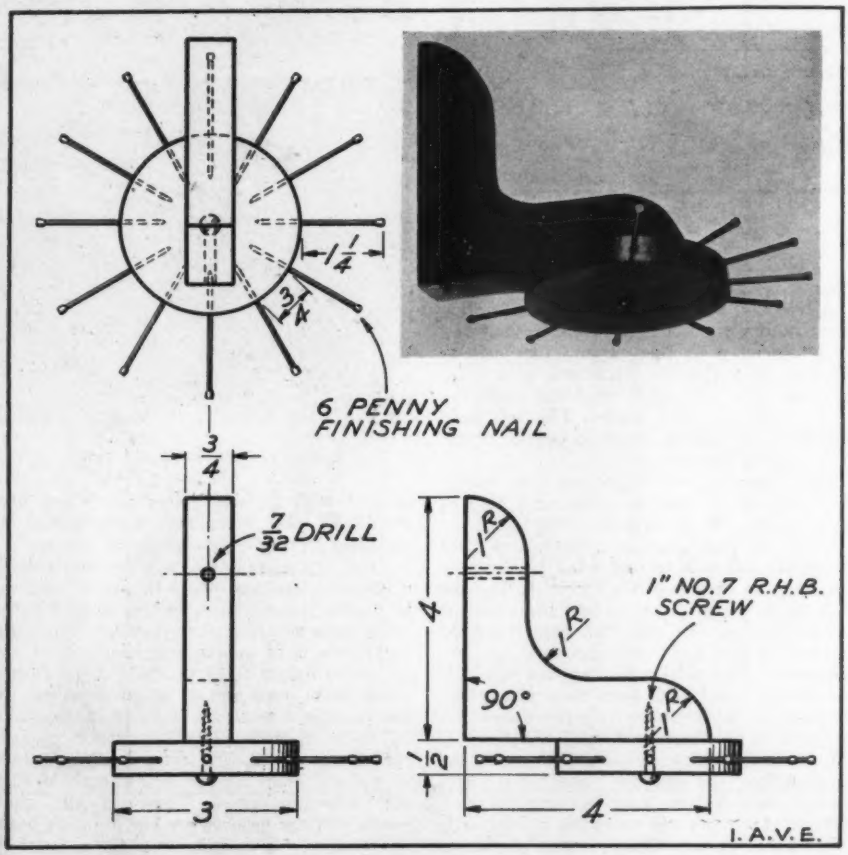
Submitted by Otto E. Henkel, High School, Longmont, Colo.

Cleaning Stone Sills

Mix 1 gal. soft soap with 1 pt. household ammonia and 2 lb. pumice stone. Remove dust and soot from the stone and apply the mixture, letting it remain for ½ hour. Then scrub with a stiff brush, and rinse well with water.




METAL BOOK END
Hammer-mark frame with small ball-peen hammer
Tool No. 3
Tool No. 2 Enamel background black
Tool No. 2
Tool No. 2
Tool No. 3
Sheet metal 1/32" to 1/4" thick
Solder frame pieces to panel on back.
PATTERN
1
2
3
TOOLS REQUIRED AND MARKS MADE BY EACH- GRIND CENTER PUNCHES TO THE ABOVE SHAPES.
No. 1 For outlines
No. 2 For background matte areas.
No. 3 For small peen marks.
Glue felt to bottom
Rounded Bottoms



Tie rack

Above, Metal Book End, submitted by E. A. Rerucha, Franklin Park, Illinois. At left, Necktie Rack, by C. H. Sechrest

A UNIQUE NECKTIE RACK

C. H. Sechrest,
Durfee Intermediate School,
Detroit, Michigan

The necktie rack described herewith has been used with much success with beginners in woodwork. It is made to hold 12 ties or more. The wooden parts of the rack can be made of any kind of wood. Some of the boys have made the disk of basswood and the bracket of gumwood. The contrast of colors adds to the appearance of the finished rack.

Common nails, screw hooks, wire, or wooden pegs can be used for pegs instead of finishing nails. The holes for the pegs are approximately ¾ in. apart. Dividers may be used to lay out the locations for the holes on the edge of the disk. Pilot holes should be drilled to prevent the pegs from splitting the disk.

AN INEXPENSIVE BLOWTORCH

W. Arthur Filler,
Baltimore, Maryland

For some time I have been interested in organizing art-metal work, so that it may be done at home as a hobby with inexpensive equipment. One of the greatest problems that I encountered was finding some type of blowtorch that would do silver, or hard soldering. Good alcohol torches are rather expensive and the flame is hard to control. The lead burning torches and other small torches of this type range from three dollars upward,

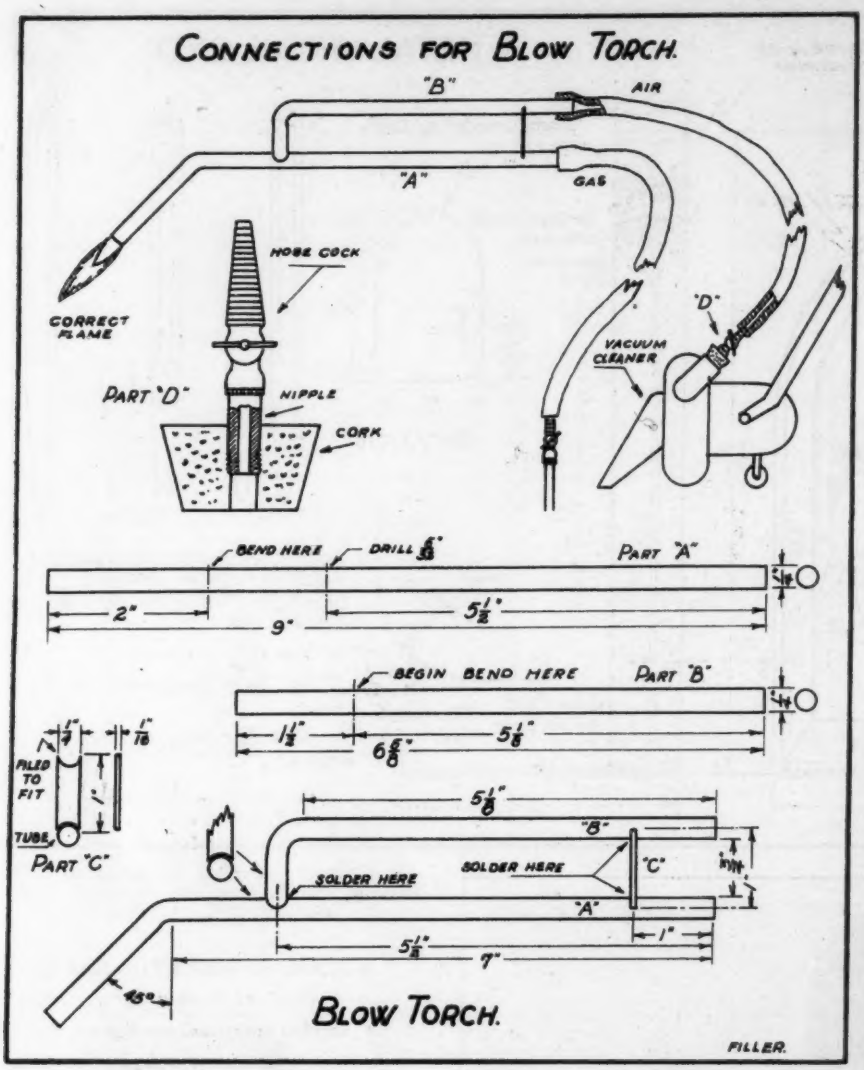


Fig. 1. Details of blow torch

and require tanks of gas and oxygen for their operation, making them too expensive for the amateur metal worker.

With these facts in mind I designed a torch that will work satisfactorily on brass, copper, silver, and other similar metals, and ordinary city gas and compressed air from a vacuum cleaner is all that is necessary for its operation.

The materials that are needed for its construction are: One piece of ¼-in. brass or copper tubing 9 in. long; one piece of ¼-in. brass or copper tubing 6⅝ in. long; one piece of sheet brass or copper 1/16 by ¼ by 1 in., one hose cock on gas outlet to control flow of gas, one hose cock with nipple for controlling the air, one large cork to fit in pressure opening of vacuum cleaner, and two lengths of ¼-in. rubber tubing, 60 in. long.

The construction is very simple. Form part *A* as shown in Figure 1. The tube should be filled with molten lead and allowed to cool before bending to prevent the closing of the throat of the bend. The tube may be then placed in a vise and formed, using a mallet to do the bending. Remove the lead after the bend is completed and drill a 5/32-in. hole on the upper side of the tubing 5½ in. from the end, as shown.

Form part *B* as shown. To get the more rounded bend place the tube in a vise so that the edge of the jaws come to the line marked "Begin bend here" thus leaving 1½ in. of tubing projecting beyond the jaws of the vise. Over this place a length of a small size iron pipe and apply pressure until the tube is bent at right angles. File this bent end with a round file until it will fit neatly over the hole drilled in *A*.

File support *C* to shape and size shown. Assemble, and if possible solder with hard or silver solder. The torch is then completed.

Attach one hose cock to a nipple and force the nipple into a hole which has been cut in the cork, as shown at *D*, Figure 1. Be sure that this is a tight joint so that there will be no air leakage. Remove the bag from the vacuum cleaner and force the cork into the connection from which the bag was removed. Attach the other hose cock to a gas outlet. Connect the rubber tubes from the air and gas supplies to the blowtorch, and the torch is ready for operation. Turn on the gas and light. Adjust the gas flow until the largest possible *silent burning flame* has been obtained. A flame that roars will not work satisfactorily as it blows out very easily. Start the vacuum cleaner and open the air valve until the torch burns with a sharp needle flame. The soldering is done at the point of the inner cone. This flame is of a sufficiently high temperature to melt brass and copper.

If the work is laid on a charcoal block, the whole section will be brought up to an even temperature quickly, thus allowing the solder to flow freely to all parts of the joint.

FOUR-HARNESS HAND-POWER LOOM

Mack E. Lathrop,

Port Jervis, New York

With the revival of interest in handicrafts of all kinds, there is a very definite place for the hand loom to be used either as a hobby at home or as an activity in the school shop.

The loom shown in Figure 1 is of fairly simple construction, and well within the ability of the amateur craftsman. It lends itself very nicely as a project for the general shop inasmuch as woodwork and metalwork are both employed in its construction.

The frame work should be constructed of some well-seasoned hardwood such as cherry or maple. All of the pieces, with the exception of the two marked *X* are made of ½-in. stock. The widths and lengths are shown in detail in Figure 2. The *X* pieces are made 1⅛ in. thick. The side pieces are fastened to the end uprights *E* with tenon joints well glued in place. The center uprights *G* are

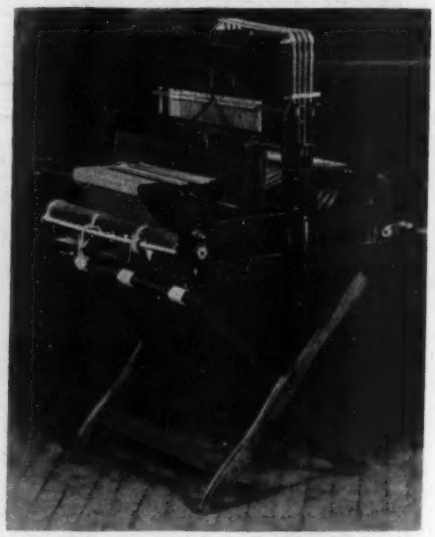


Fig. 1. Four-harness loom

secured with half-lap joints which are also glued. All the crosspieces are rabbeted at each end to fit the side pieces as shown.

After the completion of the frame work start the cloth and warp beams. It will be necessary to use a lathe for this work. For the cloth beam secure a piece of wood which will turn down to an approximate diameter of 1¾ in., and a length of 24 in. On one end turn a tenon ⅝ in. long and ⅞ in. in diameter. On the other end make the tenon 2 in. long and ⅞ in. in diameter. This long tenon receives the ratchet wheel. The warp beam is turned to a diameter of 3¾ in. with tenons at each end corresponding to those of the cloth beam. Circular grooves are cut into this beam ⅜ in. deep, ⅝ in. wide, and ⅜ in. apart to form the sectional warp beam which is more

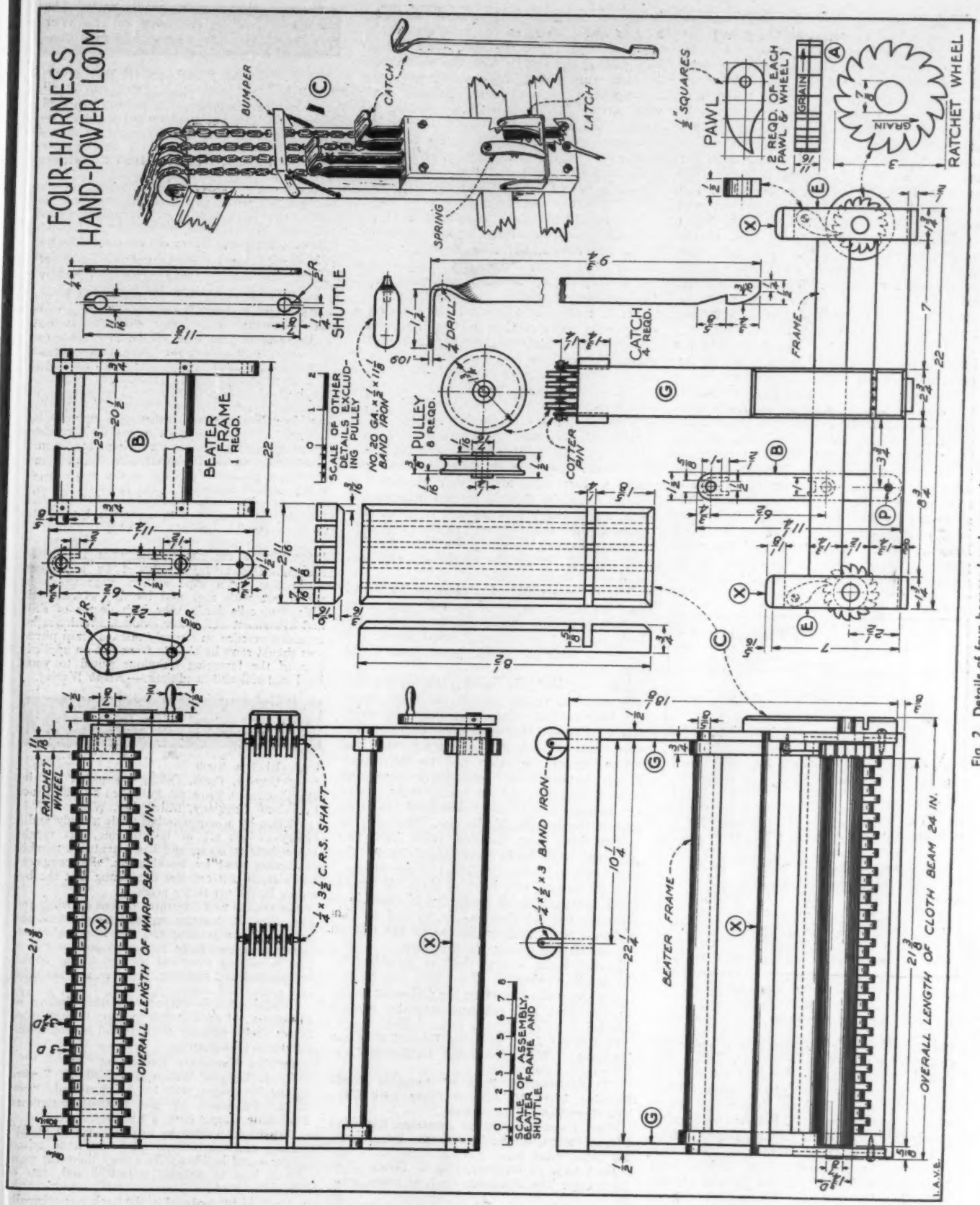


Fig. 2. Details of four-harness hand-power loom

convenient to use than the plain surface beam. In warping a loom with the plain beam all of the warp threads have to be wound on at one time, which usually means handling several hundred threads at once. With the sectional device the threads can be divided and only one section wound at a time.

The ratchet wheels should come next. They should be made each of two pieces of ⅜-in. hardwood stock, glued face to face with the grain running at right angles to each other as shown in *A*, in Figure 2. Bore a ⅞-in. hole through the center of each. Lay out and cut teeth as shown in the drawing. When finished, glue and dowel one ratchet to the long tenon of each beam. To mount these beams in the frame bore ⅞-in. holes at the points shown in the side view. When in place, make and mount the pawls directly above the ratchets. These are each held in place by one screw which acts as a pivot.

The pulleys over which the chains ride can be made from solid brass or they may be cast from brass or aluminum.

The beater frame consists of two uprights and two crosspieces as shown at *B*. To make the crosspieces, secure two pieces of hardwood 1 by 1½ by 23 in. Center the ends of the pieces, and turn a tenon on each end ⅝ in. in diameter by 1¼ in. long. With the dado cut a groove on the projecting side of these pieces ½ in. deep and ½ in. wide. The side pieces or uprights are ¾ by 1½ by 11¼ in. Round off the ends and bore the ⅝-in. holes as shown. Insert tenons of the crosspieces, see side view for positions of the grooves, pin tenons in place with ¼-in. dowels

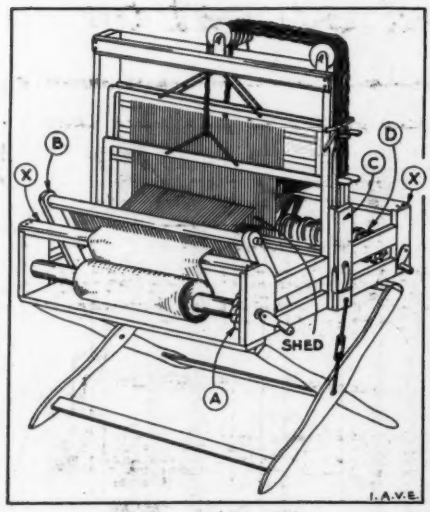


Fig. 3

and cut off the protruding tenon of the lower crosspiece flush with the surface. These pins should be removable in order to place or remove the reed in the beater frame. When assembled, place in loom frame and hinge with a screw at point *P*. Follow the drawing closely for the details of the beater frame.

This loom is made to take a 20-in. reed (15 dents to the inch), 8-in. heddles, and 20-in. heddle frames put out by the Structo Mfg. Co., Freeport, Ill. These parts can be made by hand. However the beginner will do well to purchase them from some company.

For the uninitiated, simple weaving is merely a matter of raising half the warp threads and drawing down the other half to form what is called the shed (see Fig. 3) then passing the shuttle with the weft thread through. This raising and lowering process is accomplished by use of the heddles. Each warp thread is threaded through a heddle; the heddles are held in the heddle frames; by moving these frames up or down the warp is carried to the necessary positions. The reed through which the warp threads are passed is moved forward and beats the weft firmly in place.

The next step is the construction of the mechanism for operating the heddle frames. With this device, when the operator raises one or more heddle frames, the frames which are already up are automatically dropped to the bottom position.

Select a piece of hardwood and cut to the dimensions given at *C* in Figure 2. Cut four ⅛ by 9/16-in. grooves the full length of the piece. This is done with the ⅛-in. dado head on a power saw. Next cut a dado ¼ by ⅝ in. across the piece 1⅝ in. from the lower end as shown.

The catches are made of 4 pieces of ⅛ by ½ by 11-in. band iron. At a point 1⅞ in. from one end of each, make a short ¼-in. turn twist. Then 1¼ in. from the same end make a sharp right angle bend, as shown in Figure 2. In the straight section between the right angle and the twist, drill a ¼-in. hole to receive the chain connecting the catch with its corresponding heddle frame. At the other end cut and file a notch to the exact dimensions given in the detail.

The latch is made of a piece of ⅛ by ½ by 7-in. band iron. Bend up each end so as to leave a straight middle section 3⅛ in. long. Drill each end to receive a wood screw. The spring is made of ½-in. spring brass about 3 in. long.

To assemble this mechanism screw the wooden block to the side of the loom, insert the four catches, make sure they can move freely, pass one end of a 24-in. piece of furnace chain through the hole in the catch and fasten, secure the other end to the proper heddle frame. Screw the latch in place but leave it loose enough to move freely, fasten the spring in place so it will hold the latch against the bottom of the slot. When all the catches have been installed, push down two until the latch holds them, then depress the other two and see if the first two are released and the second two held. A little oil should make the parts work perfectly. If there is a tendency for the chain to fly up and off the pulley, a little bumper similar to the one in the sketch will relieve the difficulty.

Lastly, make several shuttles according to the detail drawing.

For the amateur weaver the following books of directions and patterns may be recommended:

Foot-Power Loom Weaving, Edward F. Worst (Milwaukee, Wis.: The Bruce Publishing Co.), 275 pages, price, $6.

The Shuttle-Craft Book of American Hand-Weaving, Mary M. Atwater (New York City: The Macmillan Co.), 275 pages.

Hand Loom Weaving for Amateurs, Kate Van Cleve (Boston, Mass.: The Beacon Press, Inc.), 122 pages, price, $1.

First Steps in Weaving, Ella V. Dobbs (New York City: The Macmillan Co.), 85 pages, price, $1.

The Game of Weaving, Osma Couch Gallinger (Scranton, Pa.: International Textbook Co.), 110 pages, price, $1.

ANSWERS TO QUESTIONS

STAINING SAP STREAKS IN WALNUT

1069. Q.: We have purchased walnut which has a considerable amount of steamed sapwood. The market does not consider this a defect, yet when built into furniture, unless carefully stained to match the heartwood, it is objectionable. What is the most efficient means of matching it? — *A. V. L.*

A.: Steamed sap in black walnut is, as you say, not recognized as a defect in the trade. In factory practice, however, it is invariably ripped out, such edgings being worked up into moldings or other forms where the off color does not appear against the darker heartwood. I would recommend a similar practice in your case hereafter.

For the present it will be best to stain the sap areas with a two-ounce walnut water stain and before the entire area affected has had a chance to dry, go over all the work with the full strength or four-ounce color. Stain solutions should all be made up on the standard strength of four ounces of aniline dyestuff per gallon of hot, but not boiling, water since at high temperatures some colors break down. Such material kept in gallon glass or earthenware jugs can be reduced as circumstances require. For accurate toning of sap areas, a touch-up gun capable of fine adjustment in the hands of a skilled operator is a prerequisite. This is the work of a highly trained specialist in the furniture factory and only with similar materials, equipment, and training can you hope to approach his results on a comparable basis.

In many cases a clear coat of sanding sealer is applied to check the quality of the water staining. This is then followed by a lacquer shade coat, or a wipe with a glaze which is wiped out with rags and blended as required. This, too, calls for a very high degree of skill and judgment of color values. With some extended practice on strongly marked scrap pieces you should soon be able to work out an application of the foregoing technique suited to your local material and conditions. — *Ralph Waring.*

NEW PUBLICATIONS

Let's Bind a Book

By Guy A. Pratt. Cloth, 137 pages, 6¼ by 9¼, illustrated. Price, $2. Published by The Bruce Publishing Company, Milwaukee, Wis.

Written by a man who has made a study and a hobby of the art of bookbinding, has taught others how to do it, and has patented a number of devices used by bookbinders, this comparatively small text contains everything that the beginner in the art really needs.

The book is well illustrated by line drawings and half tones. It contains an interesting bit of the history of bookbinding and then thoroughly explains what equipment is needed and how it is used in making loose-leaf binders, sewing books, constructing and finishing the cover, and marbling and gilding the edges.

It also contains chapters on the binding of pamphlets, the bookbinding industry in the United States, and a glossary of trade and related terms, besides a bibliography.

Simplified Carpentry Estimating

By J. Douglas Wilson and Clell M. Rogers. Cloth, 204 pages, 4¾ by 7, illustrated. Price, $2.50. Published by the Simmons-Boardman Publishing Corp., New York City.

This book, written by men well versed in estimating and calculating, offers to trade school students and builders alike a very thorough manual on how to estimate quantities and costs of carpentry work.

Much of the material in the book was originally published in articles which appeared in the Amer-

(Continued on page 14A)

DISSTON SMALL SAWS

find much to do in vocational education

IN school workshop, complete equipment is important... there should be a saw to do each particular job better. Disston realizes the need for many types of saws in vocational education.

Disston, too, knows the need for quality. In 1855, the first crucible saw steel ever made in America was produced in the Disston plant. Disston Saw Steel gives you tools that are a credit to vocational training.

For many years, Disston has issued charts and educational literature for the use of instructors.

In addition, Disston years ago adopted a service of repairing and refitting school equipment, at nominal cost, in order that schools could get the best possible results from equipment used.

Samples of Disston Hand Saw, File, and Hack Saw Charts, and educational literature will be sent to instructors on request. Ask also for Disston Refitting list for school requirements. Write to:

HENRY DISSTON & SONS, Inc., PHILADELPHIA, U. S. A.

FOUR USEFUL DISSTON SMALL SAWS

Disston No. 4 Back Saw—Handiest of all small saws. Use it for fine joinery and cabinet work. Blade of Disston Steel—hard, tough. Teeth shaped for fast, accurate cutting. Back of extra-heavy, polished steel. Beechwood handle with Disston weatherproof finish; brass screws. 5 sizes: 8" to 10" blades; 16 to 12 points.

Disston No. 2 Compass Saw—Open grip handle for easy control. Disston Steel blades, toothed to point. Taper-ground for clearance. Tempered to stand strain of curve-cutting. Applewood handle; Disston weatherproof finish; brass screws. 8 point. Sizes: 10, 12, 14, 16 inches.

Disston Dovetail Saws Nos. 68, 70, 71—For dovetailing, tenoning, model building, pattern making... wherever finest possible joint is needed. No. 68 (illustrated) has straight handle. No. 70, open grip handle. No. 71, same as No. 68, with handle and blade offset to permit cutting with blade flush to board. All extremely thin (.018"), with fine teeth (17 points). Sturdy brass-plated steel back supports Disston Steel blade.

Disston No. 10 Coping Saw—Frame of Disston Steel, 4½" from tooth edge of blade to inside of back. Polished hardwood handle. Nickel-plated ferrule, machined stretchers. Blades available for cutting wood, bakelite, brass, celluloid, bone, composition board, copper, other metals.

ADVERTISING PAGES REMOVED

(Continued from page 394)

ican Builder and Building Age. After a thorough revision, it was then given the permanent form under which it now appears.

The book has been divided into seven chapters under the following headings: Estimating Fundamentals, Foundation Material, Framing, Exterior Finish, Interior Finish, Hardware, Building Information, and Tables.

Science for Handicraft Students

By H. Morton. Cloth, 143 pages, 5¾ by 8¼, illustrated. Price, $3. Published by the Chemical Publishing Co., Inc., New York City.

While this book is based on the syllabus in elementary science for the handicrafts teachers' examination of the City and Guilds of London Institute, the book can be used as a text in science for classes in wood- and metalwork.

The book contains chapters devoted to the following scientific principles: Measurements, The Parallelogram and Triangle of Forces, Moments, Friction and Work, The Conservation of Energy, Machines (A), Machines (B), Heat, The Properties of Materials, The Chemistry of Air and Water, The Electric Circuit, Magnetism and Electromagnetism, Ohm's Law, and the Heating Effects of Current.

House Construction Details

By Nelson L. Burbank. Cloth, 317 pages, 8¾ by 11¼, illustrated. Price, $3. Published by Simmons-Boardman Publishing Corp., New York City.

This book is a compilation of construction details, tables, and an explanatory text which will be very helpful in the school carpentry shop, or in the drafting room, both on the industrial-arts and on the vocational level.

Practical Shell Developing for Steel Shipbuilders

By Adam F. Tulin. Cloth, 153 pages, 6¼ by 9¼, illustrated. Published by Simmons-Boardman Publishing Corp., New York, N. Y.

A book for the apprentice and the mechanic in shipyards where steel vessels are built. The book contains eight chapters which cover the following subjects respectively: Shell-plate developing and expanding, sight-edge expansions, transferring fore and aft lines from the body, lining in frame lines, lining in butts, thickness plotting, stretching and drawing templates, and miscellaneous.

The bow tables at the end of the book are exceedingly useful to the men practically employed in steel shipbuilding.

♦ "Manual of Radio Servicing" is a new booklet just put out by the Supreme Publications, 3727 West 13th St., Chicago, Ill. This 32-page booklet contains important hints on radio operation and servicing. This manual is free of charge to the readers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION and can be procured by writing to the above address.

PERSONAL NEWS

♦ DR. CLARK ADELBERT FULMER, Nebraska state director of vocational education for 22 years and former chancellor of Nebraska Wesleyan University, died on September 11. He had been recently appointed state director of vocational training under the National Defense Program.

Dr. Fulmer was born on April 22, 1867, in Marcellus, N. Y., and shortly thereafter moved with his parents to Gibbon, Neb. There he attended public schools, the Nebraska Baptist Seminary, and graduated from the Fremont Normal School in 1892. He received the Ph.B. degree from Nebraska Wesleyan; M.A. from University of Nebraska; LL.D. from Grand Island College; and Ed.D. from Nebraska Wesleyan. His honorary fraternities include Phi Delta Kappa, Phi Kappa Phi, and Phi Gamma Mu.

Early in his career, Dr. Fulmer was a rural school teacher near Gibbon; high school principal at Gibbon four years; and superintendent of schools at Edgar, Neb., six years; at Pawnee City, Neb., six years, and at Beatrice, Neb., six years.

He was a member of the Sons of the American Revolution, Nebraska Schoolmasters club, American Vocational Association, National Association of State Directors of Vocational Education. He also held office at one time or another in the southeast Nebraska Educational Association, Nebraska State Teachers Association, and a number of other professional organizations.

He is survived by two daughters; a son, Dr. Ellis I. Fulmer of Ames, Ia.; two sisters; a brother and four grandchildren.

♦ RICHARD R. CROW has joined the industrial-arts staff of the State Teachers College at California, Pa. He was elected to fill the vacancy caused by the resignation of Prof. R. Lee Hornbake, who has accepted a position at the State Normal School, Oswego, N. Y.

Richard R. Crow

Mr. Crow, a former graduate of California received his graduate training and M.A. degree in 1938 from the Ohio State University. He has taught in one of the Franklin county arts and industries demonstration laboratories at New Albany, Ohio. His other teaching experiences were gained at Zelienople, Pa., and the Culver Military Academy, Culver, Ind. During the past two years he has served as the director in developing and establishing an industrial-arts program in the government resettlement project in Greenhills, a suburb of Cincinnati, Ohio.

♦ A. ARNOLD HILL of New York City, has been appointed as assistant director of the Division of Negro Affairs of the National Youth Administration. Mr. Hill's duties will be to assist Mrs. Mary McLeod Bethune, head of the Division, in co-ordinating and developing the employment of Negro youth on NYA projects.

Mr. Hill has been an official of the National Urban League for the last 25 years, serving as western field organizer, director of industrial relations, and also as executive secretary of the Chicago Urban League. In this capacity he made extensive studies in the fields of labor and race relations. He left the Urban League last May.

In 1938–39 he was a consultant for the Works Projects Administration.

Mr. Hill is a native of Richmond, Va., and was graduated from Virginia Union University at Richmond with an A.B. degree in 1911. He has studied in New York University's graduate school.

♦ J. V. HAMILTON, for many years director of industrial arts and director of the Chanute Trade School, Chanute, Kans., has been given leave of absence for one year by the Chanute board of education, in order to continue work he began during the summer for the state NYA office. Mr. Hamilton has been adviser in the matters of selecting space, remodeling, buying and installing machinery, and securing competent instructors in the state NYA instructional centers.

♦ JAMES GILBREATH, for 15 years instructor in drafting and metalwork, has been named acting director in Mr. Hamilton's place. Both men are graduates of the Kansas State Teachers College of Pittsburg. Mr. Hamilton has a master's degree from Colorado State College, Fort Collins, and Mr. Gilbreath the same degree conferred by Colorado State College of Education, Greeley.

♦ FLOYD E. LENTZ, head of the mechanical drafting department of Garfield Heights High School, Cleveland, Ohio; graduate of Ohio State University, 1922, received his M.A. degree last June. The Ohio State Board of Education also awarded him an eight-year High School Principal's Certificate on September 1, 1940.

He spent the past summer in getting practical experience in the aircraft industry. This experience will help greatly in reorganizing his school drafting department to conform to the needs of the National Defense Program.

♦ SYLVAN A. YAGER, of the Indiana State Teacher's college laboratory school, has been appointed head of the industrial-arts department to succeed Merit L. Laubach who resigned recently.

Mr. Yager holds the B.S. degree from Indiana State College, the M.A. degree from Indiana University and he is now completing work on his doctorate at the latter institution. He has been president of the Indiana Industrial Education section of the Indiana State Teachers Association. He is also the author of many professional magazine articles.

♦ J. E. MOORE, who for sometime has been a machine-shop instructor in the day trade, evening, and National Defense Programs at Wichita, Kans., is now located in Pittsburg, Kans. Here he will direct the new industrial education program which is under way, instruct the day trade machine-shop classes, and serve as local director of the evening school program.

♦ HERBERT ROSENTHAL has been elected to teach industrial arts at the John Dewey Junior High School, West Allis, Wis. He replaces Earnie Zarling who has gone to Saginaw, Mich.

♦ OSCAR GRONSETH, who taught mechanical drawing and printing the past year at Plainville, Conn., has been appointed to take charge of the new graphic arts shop at the Nathan Hale Junior-Senior High School, West Allis, Wis.

♦ EDWARD HUGHDAHL, who taught general shop for the past five years at Waupaca, Wis., has been appointed to teach machine-shop work and auto mechanics in the Thomas Jones Senior High School, West Allis, Wis.

♦ KERMIT MILLER will be in charge of the manual training department which has been reinstated this year at the Mt. Carmel, Ill., High School.

♦ HOMER WARNER, of Purdue University, Lafayette, Ind., will be vocational teacher in the Wayne Township School, Waynetown, Ind.

♦ WAINO THOMPSON, teacher of industrial education at the Pekin High School, Pekin, Ill., for the last four years, has resigned to accept a position at Bradley Institute. Mr. Thompson will instruct in classes which have been recently organized to train men for jobs in the National Defense Program.

♦ GEORGE S. STEWART, formerly metal-shop instructor at the Bloom Township High School, Chicago Heights, Ill., will succeed Waino Thompson at the Pekin High School, Pekin, Ill.

♦ J. C. WOODIN, supervisor of industrial education at Wichita, Kans., spent June and July as professor in aircraft training at Columbia, Mo. C. W. Popkins acted as supervisor in the absence of Mr. Woodin.

♦ Industrial-arts majors who were granted degrees at Ohio in June and August, 1940, have been appointed to teaching positions in the following cities and towns: Lewis Gray, High School, Franklin, Ohio; George Clemmer, High School, Barberton, Ohio; Cecil Pfaff, Township Schools, Athens, Ohio; Donald Perry, Liberty High School, Lower Salem, Ohio; Dale Roth, High School, Greensboro, Md.; Nichlos Tenmik, High School, Huntington, W. Va.; George Rebich, High School, Wellsburg, W. Va.; Harley Haskins, Elyria, Ohio; George Boothe, Ironton, Ohio; Frank Leone, Dunbar High School, Charleston, W. Va.; Thomas Brennan, Charleston, W. Va.; and Robert Masterson, Bainbridge, Ohio. Allen Knisley is a graduate assistant at Ohio University for 1940–41.

(Continued on page 17A)

A "Boy Proof" BRACE FROM HEAD TO JAWS

★ Interlocking jaws which cannot slip, jam or come out.

★ Square steel socket, built into the body of the chuck, centers square taper shank bits automatically.

★ Entire chuck locked in place with a nut and cotter pin. No parts to be lost.

★ Steel clad Cocobolo head.

★ Bronze bushed, ball bearing construction of head that gives friction-free operation.

★ Fully enclosed box ratchet, smooth acting and durable.

Write for your copy of catalog 34, describing the full line of Stanley Bit Braces and other "Boy Proof" Tools.

Bit is automatically centered when dropped into square socket.
Nut and cotter pin lock, entire chuck in place, including jaws.
STANLEY
TRADE MARK
Stanley "Boy Proof" Bit Brace No. 919. Four sizes: 8, 10, 12 and 14 inch sweep.

STANLEY TOOLS

Educational Department, New Britain, Conn.

(Continued from page 14A)

♦ WILLIAM M. MCAULAY was appointed teacher of woodwork and of mechanical drawing at Cranston, R. I.

♦ ARTHUR L. FULKERSON, supervisor of the manual training department in the Lawrence High School, Lawrence, Mass., retired at the age of 70, after 45 years of service at the high school.

♦ EDWARD H. MCCABE, supervisor of the machine department was promoted to the position made vacant by Mr. Fulkerson's retirement.

♦ PATRICK NEVINS, who has been teaching industrial-arts work in the elementary schools of the Lawrence, Mass., system, was promoted to teach this subject in the high school of that city.

♦ CARL G. ZEINER was elected to teach industrial-arts work in the elementary schools of Lawrence, Mass.

♦ EARLE R. BISHOP, who is a member of the faculty at Highland Park Junior High School, Dallas, Tex., received the degree of M.Ed. with a major in industrial education from the Texas Agricultural and Mechanical College, College Station, Tex.

♦ DUDLEY CADE, who taught vocational auto mechanics at Frontenac, Kans., has resigned to teach at Chapman, Kans.

ASSOCIATION NEWS

♦ The Everett Vocational Club of Everett, Wash., elected officers and organized the annual calendar of monthly meetings during the first meeting of the 1940-41 school year. A committee was organized to arrange a series of industrial trips designed to familiarize the teacher with local industries. It is planned to invite all the teachers in the system to participate in the educational trips. Charles Rice was elected president and B. E. Smead, secretary-treasurer.

Coming Conventions

District meeting of the Industrial Arts and Vocational Education Teachers Association, October 17, at Springfield, Mo. Pres., Pat H. Atteberry; Secy., Chad Cowherd.

Missouri Vocational Association, November 6-7, at Kansas City, Mo. Pres., Minnie L. Irons, University of Missouri, Columbia, Mo., Secy., L. C. Thornton, Norborne, Mo.

National Association of State Directors of Vocational Education, December 13 and 14, at San Francisco, Calif.

State Supervisors and City Directors of Vocational Education, and Trade School Principals, December 15, at San Francisco, Calif.

American Vocational Association, December 16-18, at Fairmont Hotel, San Francisco, Calif. Pres., Dr. Robert O. Small, State Department of Education, Boston, Mass., Secy., L. H. Dennis, 1010 Vermont Ave., Washington, D. C.

Eastern Industrial Arts Conference, April 26, 1941, at State Teachers College, Millersville, Pa. For information write E. E. Howard, director, industrial arts education, State Teachers College, Millersville, Pa.

♦ The Fairfield County Industrial Arts Association held its first meeting of the current school year at Strattford High School, Strattford, Conn., on September 25. The Strattford High School shops were open for inspection.

The new officers, Wesley Ketcham, pres., Lawrence Houle, 1st vice-pres., William Torno, 2nd vice-pres., and Benjamin Isenberg, sec.-treas. outlined and discussed plans for the year.

The principal speaker was Mr. Edward Welch, ivory, stone, and wood carver of Norwalk, Conn. Mr. Welch exhibited a fine collection of his carvings in various mediums and discussed methods of procedure and technique. — *Earl V. Flagg.*

♦ The seventh annual Conference on Business Education was held at the School of Business of The University of Chicago on June 27 and 28. This year the Conference had as its theme "Business Education for What?" It was widely attended by classroom teachers and administrators of business education from all parts of the country. In addition to the activities of the Conference itself, the Work Committee, which was organized in 1939 and produced a report on Standards in Business Education that year, continued its discussion and refined and made more practical the report of the previous year.

The Conference itself dealt with three major problems. The first was: *Can business be studied without bias?* Prof. Louis Wirth of The University of Chicago presented a paper on "Biases Involved in the Study of Business"; Dean W. H. Spencer of the School of Business of The University of Chicago gave a paper on "Propaganda for Business and against It"; and Paul Selby of the Northeast Missouri State Teachers College contributed a paper on "Business Education and the Problem of Bias."

The second major issue considered was *business education and the consumer's interests.* Major contributors to this program were: Prof. Kenneth Dameron of Ohio State University; Donald E. Montgomery, Consumers' Counsel for the Agricultural Adjustment Administration, who presented a paper on "What Consumer Education Can Accomplish"; and Leverett S. Lyon, Chief Executive Officer of the Chicago Association of Commerce, who spoke on "Toward Efficient Marketing in the Interests of All."

The final formal Conference session was concerned primarily with the problem of *Business Education and Individual Adjustment.* Mrs. W.

(Continued on page 18A)

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(Continued from page 17A)

S. Hefferan, a member of the Board of Education of Chicago, presided at this session; and the contributors were Prof. Daniel A. Prescott of The University of Chicago, who spoke on the problem of adjustment of the individual in school life; R. N. McMurry, executive secretary of the Chicago Office of the Psychological Corp., who spoke on similar problems during the employment period; and Dr. Alexander A. Liveright, executive director of the Jewish Vocational Service and Employment Center of Chicago.

Following the formal program, the Conference reviewed the activities of the Work Committee. Mrs. Frances Doub North, president of the Department of Business Education of the National Education Association, presided at this session, and W. S. Barnhart of the Indianapolis public schools presented a paper which summarized the on-going work of the Work Committee. Mr. Barnhart's discussion was followed by a panel on the problem of "Business Education and Conflicting Social Viewpoints," to which the contributors were Elvin Eyster of the Fort Wayne Schools; Lester Schloerb, director of occupational research for the Chicago public schools; Dean Ernest O. Melby of the School of Education at Northwestern University; and Prof. Henry Harap of the George Peabody College for Teachers at Nashville.

The general Conference *Proceedings* will be available during the fall of 1940. In addition to the papers which were presented at the Conference there will be included in the report the present statement of the Work Committee on Standards in Business Education. Plans for the 1941 Conference will be announced in the early winter.

Speakers at National Student Graphic Arts Society Program: left to right, R. Randolph Karch, principal, Printing High School, Cincinnati, Ohio; Edward W. Kurtz, Detroit, Mich.; Harold H. Kirk, chairman, Washington, D. C.; George T. Hart, Rochester, N. Y.; Sidney S. Schustermann, Cleveland, Ohio; and Fred W. Miller, Fort Worth, Texas.

SUMMER SCHOOL NOTES

♦ Throughout the Summer Session at Ohio University, Athens, Ohio, Wednesday noon luncheon meetings were held, sponsored by EPSILON PI TAU, National Professional Industrial Arts Fraternity, and directed by the industrial-arts department.

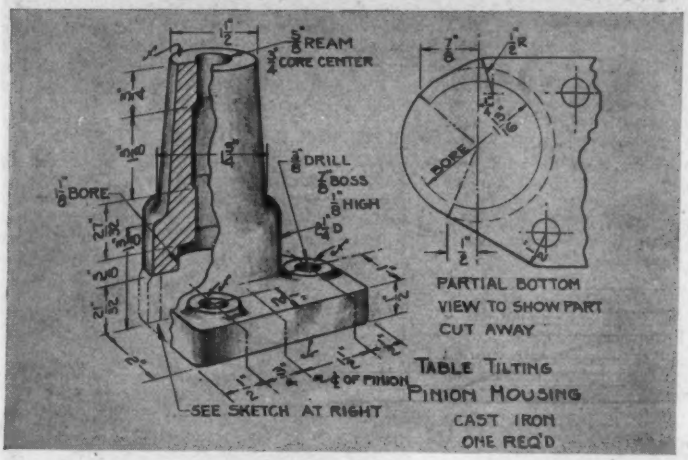
At the first meeting on June 26, the summer-school students were welcomed by the director of summer sessions, Dr. Einar Hanson and by Dean William M. Young of the college of applied science. Dr. W. J. Smith an authority on China and Japan, spoke on the topic, "The Chinese-Japanese Conflict and Its Relation to the United States."

On July 3, Alford Nellis, critic teacher in industrial arts at the Athens high school, spoke on the subject of, "The Silk Screening Process in the High School."

Elementary industrial arts was discussed on July 10 by Miss Lucille Allard, supervisor of elementary industrial arts at Garden City, N. Y., and Visiting Lecturer in Elementary Education for the Summer Session. Dr. Lee Robert Hornbake of Oswego Normal School presented, "What Can We Do in Elementary Industrial Arts Education?"

(Continued on page 21A)

CLASSROOM PROBLEM No. 6



PROBLEM: *Ask your students to draw the correct orthographic views of this table tilting pinion housing.*

SOLUTION: *For your convenience we offer a free blueprint showing the problem's solution. Write address below for blueprint No. 128-J11.*

TEACHERS of mechanical drawing have their problems, too. A frequent one is recommending to students the best drawing pencil to use. We'd like to prove to you that *Typhonite* Eldorado Pencils are best. So won't you put a Dixon's *Typhonite* Eldorado to the test? Test it for evenness — opaqueness — strength — accurate grading — freedom from grit. We rest our case on your findings.

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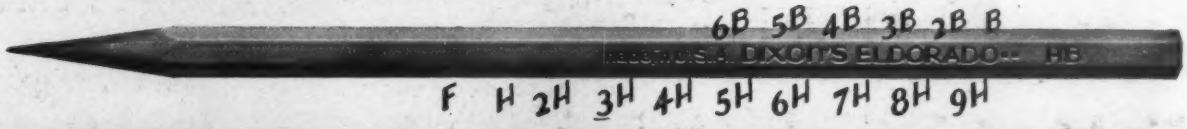


SCHOOL BUREAU, JOSEPH *Dixon* CRUCIBLE COMPANY, JERSEY CITY, N. J.

(Continued from page 18A)

July 17th found 85 summer school students in the field of industrial arts inspecting some six schools getting suggestions whereby they might improve their own teaching situation this fall.

July 24th found the forum discussing an interesting topic, "Operating a General Shop Successfully." The forum leaders were Victor L. Bowers, Visiting Lecturer, of Gladewater, Tex.; and Gordan O. Wilbur, Visiting Lecturer of Oswego State Normal School, Oswego, N. Y.

Climaxing the summer program on August 1, the annual initiation and banquet of EPSILON PI TAU was held at the Athens Country Club with 130 persons present. Preceding the banquet was the initiation. The following were on the initiating team: A. A. Nellis, Athens, Ohio; Ford S. Ball, Wellsville, Ohio; Raymond Oliver, Athens, Ohio; Ralph C. Pritts, Toledo, Ohio; Cletis D. Crawford, Massillon, Ohio; Wilbur J. Kuhn, Parkersburg, W. Va.; Edward J. Woolf, Shadyside, Ohio, and faculty sponsor James O. Stephan. The toastmaster at the banquet was Victor L. Bowers.

The guests were presented by Prof. F. Theodore Paige, chairman of the department of industrial arts for the summer session. Among those present were: Prof. Elroy W. Bollinger, supervisor of industrial teacher training in New York City; Dr. Burl Neff Osborn, State Teachers College, Millersville, Pa.; Vincent Banigan, President of Mohawk Valley Industrial Arts Association, Utica, N. Y.; Prof. Harold Palmer, Iowa State College, Cedar Falls, Iowa; Leslie Frye, President of Industrial Arts Section, Ohio Educational Association and vice-principal of Edison Occupational School, Cleveland, Ohio; Prof. John A. Whitesel, New Britain, Conn.; Prof. Aslen DeVito, Trainer of elementary industrial-arts teachers for New York City; Anthony Marinaccio, Hartford, Conn.; Willis A. Whitehead, summer industrial-arts staff of Ohio State University, Columbus, Ohio; and Robert W. Haws, Hamilton, Ohio.

The Fraternity Keys were presented to the initiates by Faculty Sponsor James O. Stephan as follows: Cyrus Gilmore, Cincinnati, Ohio; Sterling Graham, Glendale, Ohio; Harley C. Haskins, Elyria, Ohio; Ray D. Kenney, Cincinnati, Ohio; David Kuhn, Tarlton, Ohio; and Albert Miller of Corning, Ohio.

The toastmaster then introduced Dr. William E. Warner, of The Ohio State University and President of the American Industrial Arts Association, who delivered an address on, "A Program for the American Industrial Arts Association."

— *James O. Stephan.*

NEWS NOTES

♦ The board of education, Ironton, Ohio, is this year providing more vocational training for boys and girls. Two machine-shop teachers are employed under the Smith-Hughes and George-Deen laws. The home economics department is being operated under the provisions of these same laws.

♦ The Burbank, Lanier, and San Antonio Vocational and Technical High Schools, San Antonio, Texas, are being used to train approximately 1000 persons in industrial work necessary under the National Defense Program. The course will last six months with the possibility existing that another will then be started.

♦ Three new technical training courses, one in sheet-metal work, one in welding, and one in cabinetmaking, have been inaugurated by the school system of Winfield, Kans. The courses are open during the daytime, to junior and senior high school students, and to adults in the evening.

The objective of these courses is to assist in the defense program by training workers for the aircraft industry.

♦ Use of safety techniques in increasing the efficiency of plant operations in national defense industries will be emphasized in an adult course in industrial accident prevention conducted by the Center for Safety Education at New York University beginning September 23 it was announced yesterday by the director, Dr. Herbert J. Stack.

Edward R. Granniss, director of the industrial engineering division of the National Conservation Bureau, will be in charge of the course, designed for safety engineers, inspectors, supervisors, and others interested in industrial safety work.

Certificates of merit will be awarded to members of the class who successfully complete the work of the course, for which there are no formal entrance requirements.

♦ Technical courses are being offered at the Dallas, Texas, Technical High School as a defense measure, to train young men.

♦ The gymnasium of the New Glarus, Wisconsin, high school, will provide quarters for the newly introduced farm-shop and farm-mechanics course. The course will be given to junior and senior farm boys who have completed the first two years of agriculture in high school. Units to be covered in the farm shop course are: rope work, belt work and power transmission, soldering, glazing, farm concrete work, drawing and planning farm buildings, woodworking and farm carpentry, painting, tool conditioning and sharpening, forge work, repair and operation principles of farm machinery, and electricity and its uses on the farm.

♦ Occupational Index, Inc., at New York University, New York City, have just published two new occupational abstracts in six-page leaflet form, entitled "Milliner" and "Window Display Worker."

Each leaflet summarizes briefly the nature of the work, abilities essential to success, training and education required, means of entering and advancing, earnings, number and geographic distribution of workers, probably future trends of employment, and advantages and disadvantages of the occupation, as they are stated in the best

(Continued on page 27A)

SHOP EQUIPMENT NEWS
New Products—Publications

STANLEY SOFT FACED HAMMERS

A complete new line of soft face hammers has been developed by Stanley Tools, New Britain, Conn.

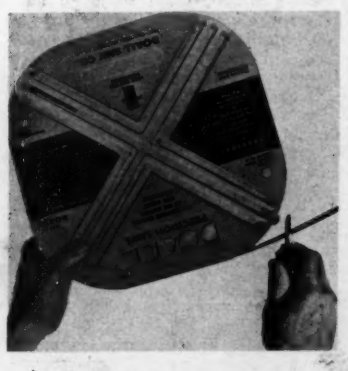
These hammers have tips made of "Stanloid" a very tough and resilient, non-metallic substance. They are ideally suited for work requiring a hammer which will not mar finely finished surfaces or when assembling delicate machine or engine parts.

They are available in various shaped tips such as ball peen, cross peen, straight peen, offset peen, square tip and regular tip for work on airplane metals, etc. For work on hardened pins and studs and assembling parts to an engine or machine the tip with brass insert is especially recommended.

Mechanics in many industries will find practical applications for these new tools. School shops that teach metalworking, machine, automobile mechanics, airplane engine assembly, etc., should be especially interested in these hammers.

NEW CONTAINER FOR SAW BANDS

The DoAll Saw Co., Des Plaines, Ill., have produced a new and improved container for saw bands. It is a metal box which is much more rigid and durable than the cardboard box originally patented by the firm, for packaging narrow band saws.

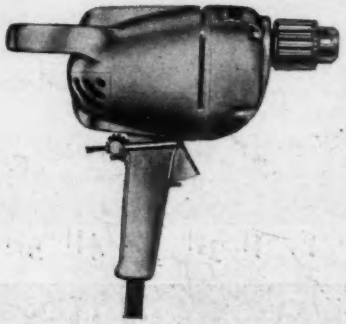


The box is so designed that the saw can be pulled out in the same manner as a tape measure is drawn out. When the desired length has been pulled out, it is snipped off, ready to weld into a band. Each box contains 100 feet of saw, and there is a "window" which shows how many feet of saw remains in the box. These boxes may be stacked on a shelf like books, and there is a label on the outside edge which gives complete specifications of the saw. The labels are in three colors to identify the three different sets, raker, wave, and straight, so that the operator can reach quickly for the correct box.

These durable, lithographed metal boxes have ribbed embossing on both sides. They withstand hard service both in shipment and for shop use.

SKILSAW'S NEW ½-INCH DRILL

A new ½-in. drill has just been announced by Skilsaw, Inc., 5035A Elston Avenue, Chicago. The new Skilsaw Model 80 Drill has many unusual features of compactness and lightweight, and in addition, it is constructed with antifriction bearings.

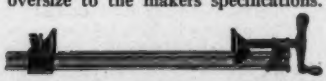


The Skilsaw Model 80 Drill weighs only 8 lbs., is 11½ in. long overall, and 9¼ in. high. Its streamlined design is an important factor in achieving the perfect balance that means easier handling of the drill in all positions. Its compact construction makes this the ideal ¼ in. drill for use in tight places. The die-cast body combines greater strength with lighter weight. Every moving shaft is mounted on friction-free ball or needle-roller bearings. Helical-cut gears bring smooth performance. The 2-pole safety switch has 100 per cent overload capacity.

A powerful Universal motor assures faster drilling. Model 80 has a no-load speed of 450 r.p.m. and a full-load speed of 300 r.p.m. Its drilling capacity in steel is ½ in. and in hardwood 1¼ in.

NEW No. 70 JORGENSEN BAR CLAMP

The self-evident stiffness and rigidity of an "I" shaped bar of special carbon-manganese content, and the security and speed of operation of the "multiple disk clutch" holding mechanism have been combined in the new Style No. 70 "JORGENSEN" Steel "I" Bar Carpenters Clamp, made by Adjustable Clamp Co., 424 N. Ashland Ave., Chicago, Ill. The nominal size of the bar in this clamp is 1½ by ⅝ by ⅛ in., rolled somewhat oversize to the makers specifications. Tests



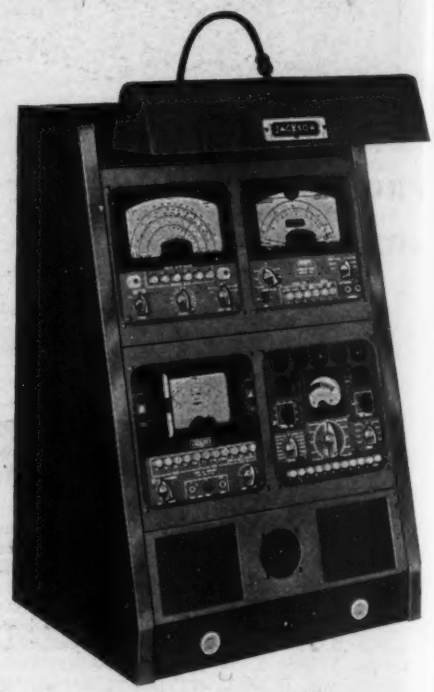
show this bar has not passed its yield-point at 6800-lbs. clamping pressure, which is beyond the power of even the strongest hands upon the crank of the clamp. The tail stop "zips" to position, where it automatically locks with a holding power greater than the strength of the bar itself.

The malleable castings are all baked enamel in orange color, except the handle which is black. The makers offer to supply a plain crank handle with loose wood grip if such is preferred, but the solid one-piece handle is recommended. The clutch disks may be easily reversed or cheaply replaced should they become worn. They are of hardened steel. There is a hardened thrust bearing in the sliding head. Clamping faces are 2 in. high and 1¾ in. wide. The screw is ⅝ in. dia. of cold drawn steel with deep, smooth threads and no surface scale.

The speed of operation of this clamp saves time and makes for better glue joints. Both material and workmanship are of that quality which has made "JORGENSEN" clamps the preference of skilled workers for many years.

JACKSON RADIO TEST EQUIPMENT

The Jackson "Service Lab" manufactured by The Jackson Electrical Instrument Co., State St. at Wayne Ave., Dayton, Ohio, is a complete assembly of four radio service laboratory instruments installed into a single bench cabinet. Each instrument is exceptionally simple to operate and test results are easy to understand.



The Jackson Service Lab assembly fills a definite need now present in industrial-arts educational courses in radio and practical electricity training. The "Service Lab" is identical with the Jackson equipment now in regular commercial use in all branches of the radio and communications industry. Thus students are afforded an opportunity to work with actual professional equipment. The use of good instruments in electricity and radio training courses, stimulates student interest, and instruction problems are vastly simplified because the success of many projects often depend upon the ability to make correct tests.

The individual instruments combined in the Jackson Service Lab assembly may be described briefly as follows:

1. The Signal Generator (upper left) produces a controllable radio frequency signal of steady intensity. This signal may be applied to a radio receiver or to any experimental RF amplifier for purposes of aligning, balancing, or general testing.

2. The Condenser Tester (upper right) for measuring the true capacity value (in microfarads) of any condenser up to 1000 microfarads, shows power factor and indicates if leakage is present.

3. The Tube Tester (lower right), is a simplified "dynamic" tube tester with direct reading, which immediately shows the condition of the tube under test.

4. Multi Range Meter (lower left) measures AC and DC voltages up to 5000 volts, measures

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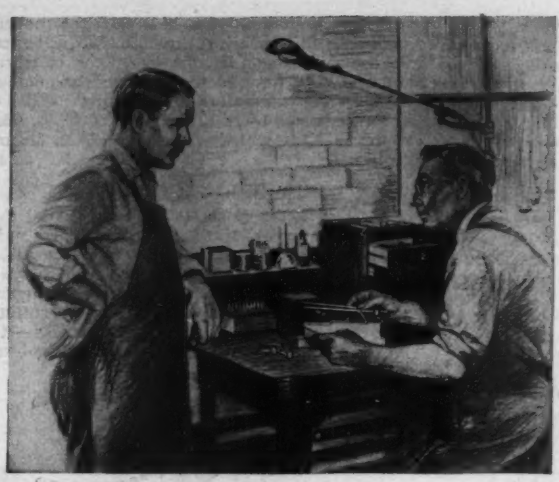

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(Continued from page 22A)

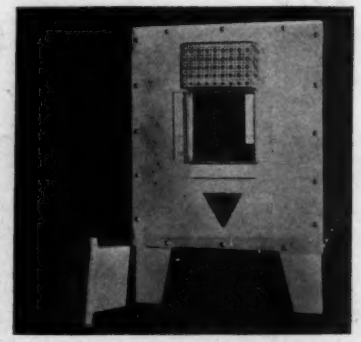
current in milliamperes and amperes. It has a direct reading ohms scale for measuring resistors from one half ohm to 30 megohms.

The "Service Lab" cabinet which houses these instruments is especially designed for practical shop use. Its dimensions are 20 by 31¾ by 16½ in. It is provided with an extra accessory panel which is already machined for easy installation of any special test pieces which might be desired. The angled front panel provides easy visibility of each instrument. Fluorescent lighting is provided by the ultra modern lighting fixture mounted on adjustable swivel at the top of the cabinet.

Full information and detailed specifications will be gladly sent to instructors interested in this type of testing instruments.

BENCH MODEL ELECTRIC FORGE

Of interest to every industrial-arts shop instructor is the new, inexpensive, general purpose bench model electric forge being announced by the Pereny Pottery and Equipment Co., Columbus, Ohio.



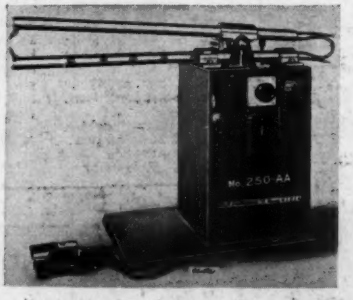
This new forge, equipped with Globar heating elements, is capable of attaining temperatures up to 2200 degrees F. quickly and safely. The forge is insulated against heat loss with 4½ inches of insulating refractory.

Among the outstanding advantages of this type of forge are its noiseless operation, cleanliness, and freedom from explosion hazards.

This Pereny electric forge has a hearth area of 5 by 5 by 10 in. deep, open at both ends with refractory plugs furnished.

50 KVA LONG-HORN SPOT WELDER

The Eisler Engineering Co. of 740–770 So. 13th St., Newark, N. J., has placed on the market a long-horn spot welder No. 250-AA for deep sheet-metal work. The new feature on this machine is



that both upper and lower horns can be lengthened or shortened to meet the requirements of the size and type of work. The new horn adjustment makes it possible to weld light and heavy work and deep metal parts. The markings on the horn represent the KVA ratings — when the horn is placed on the 25 KVA mark it represents 25 KVA, etc. The model illustrated is a 25 to 50 KVA air-operated welder.

The spot welders are made with many different styles of electrodes, and in this case, the cooling water goes through the entire horn. EISLER spot welders are made foot, air, or motor operated and will weld from 30 to 150 spots per minute, depending on the nature of the work. Available in three sizes: 5 to 25 KVA, 25 to 50 KVA, and 40 to 75 KVA with horn lengths of 30, 36, or 40 inches.

NEW BERNARD PLIERS

The new Bernard No. 402 plier retains all the valuable features of the older Bernard pliers such as the parallel jaw action (jaws open like those of a vise), the open throat through which wire may be fed, compound leverage which gives tremendous gripping power, the outside cutting jaws that snip off nails like match sticks — to all these exclusive and desirable features have been

added two additional features — longer, tapering jaws that make possible the use of these pliers in smaller spaces and, a 25 per cent greater jaw opening.

This last named feature adds greatly to the utility of this Bernard plier as it now has the same maximum jaw capacity as any type plier of the same size. This greater jaw capacity and the parallel action of the jaws give the user maximum service to be obtained from any pliers.

ABC OF SPRAY PAINTING EQUIPMENT

A free copy of the comprehensive booklet entitled the "ABC of Spray Painting" which has been made available by The Devilbiss Co., Toledo, Ohio, may be obtained by all instructors writing for it.

Those instructors who would like to get this teaching aid in quantities, should write for special purchase price quotations.

HAVE MOVED INTO NEW QUARTERS

The Lindsley Mfg. Co., formerly in Bridgeport, Conn., where they made art metal tools and specialty items for the hobby trade, have moved their plant to Milford, Conn., and are running at capacity, although their facilities have been much increased. Besides being engaged in their regular production, they are now also making fine tools and gauges for the manufacture of munitions.

NEW HANDICRAFT SUPPLEMENT

School buyers and teachers will find the new handicraft reference supplement of special interest. It is devoted to such items as scratch paper, which is very effective for making drawings for school publications; special shapes of Catalin for as little as 15 cents a pound in hundred pound lots; Hungarian looms for 25 cents; four harness metal looms at $1 an inch in 12 and 20 inch sizes; and silk screen printing sets with frames and supplies. Among other items are rubber mould materials, Polytect metal powders and colors for surfacing plaster or plastic marble casts, aluminum etching presses and supplies, electroplating sets from $2 up, wood carvers' blocks and other new materials and equipment.

This is a new supplement to the 150-page spiral-bound references catalog issued by the Universal Handicrafts Service, Inc. (formerly The Universal School of Handicrafts), now located at 1267 Sixth Ave., Suite 318, New York City.

♦ The new 1940 catalog of Important Technical and Scientific Books of the Chemical Publishing Co., Inc., New York, N. Y., contains many important new titles. Books of interest to the layman, architect, pharmacist, chemist, engineer, metallurgist, advertiser, home gardener, farmer, technician, scientist, and others, are listed in this new catalog.

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(Continued from page 21A)

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The other addresses are: 920 Southwest Sixty Ave., Portland, Ore.; 212 N. Vignes St., Los Angeles, Calif.; 200 S. Main St., Salt Lake City, Utah; 650 Seventeenth St., Denver, Colo.; 1801 N. Lamar St., Dallas, Tex; 230 S. Clark St., Chicago, Ill.; 4966 Woodland Ave., Cleveland, Ohio; Visual Instruction Section, 1 River Road, Schenectady, N. Y.; 140 Federal St., Boston, Mass.; 1405 Locust St., Philadelphia, Pa.; and 187 Spring St., N.W., Atlanta, Ga.

The following films are *no longer available:* The Western Electric Co., 195 Broadway, New York City—"Cedar Camps in Cloudland," "A Concrete Example," "Enemies of the Southern Pine," "From Swamps to Workshops," "Oil—the Wood Preserver," and "Trail of the Longleaf Pine."

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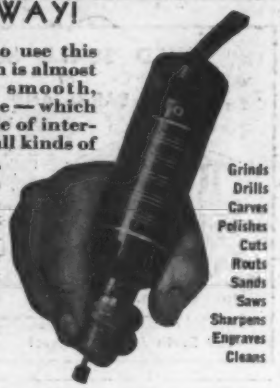

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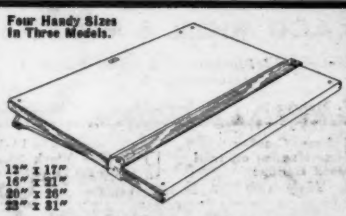

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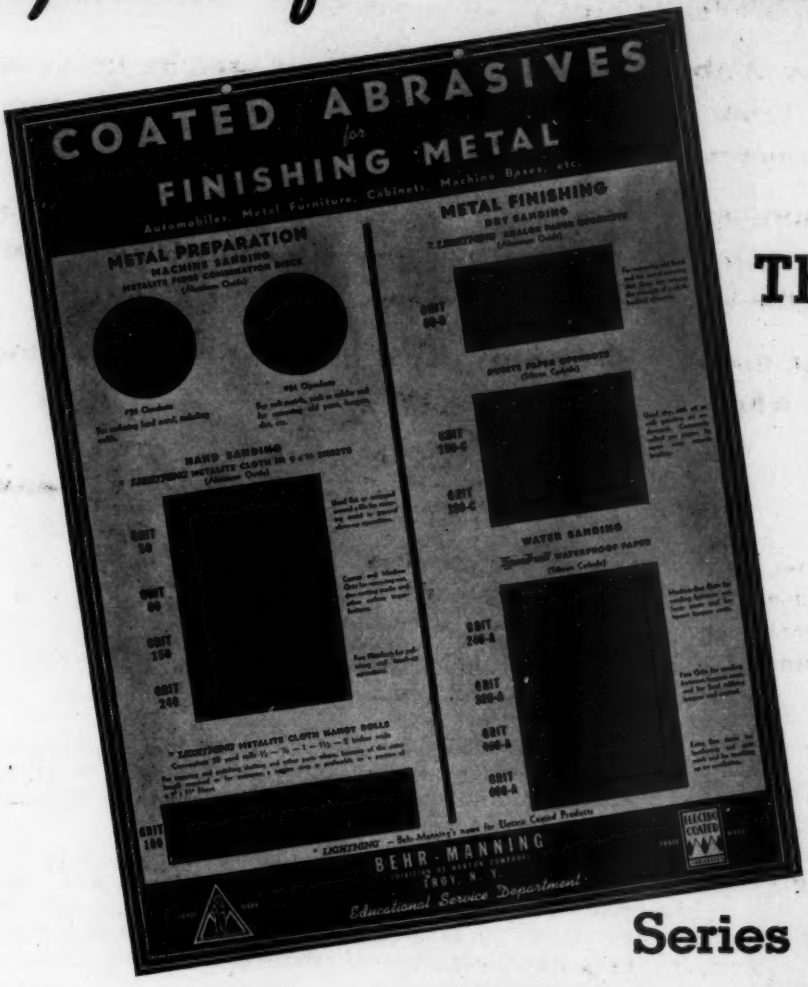

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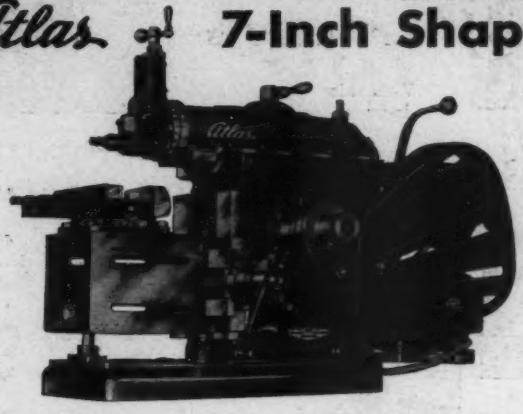

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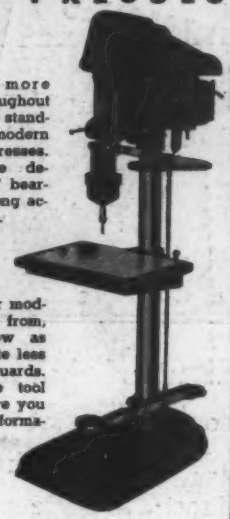

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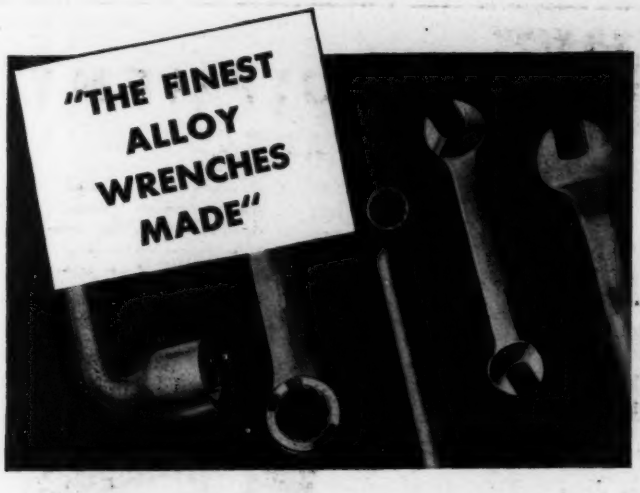

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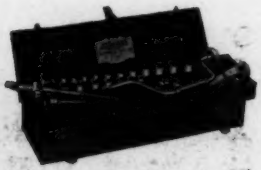

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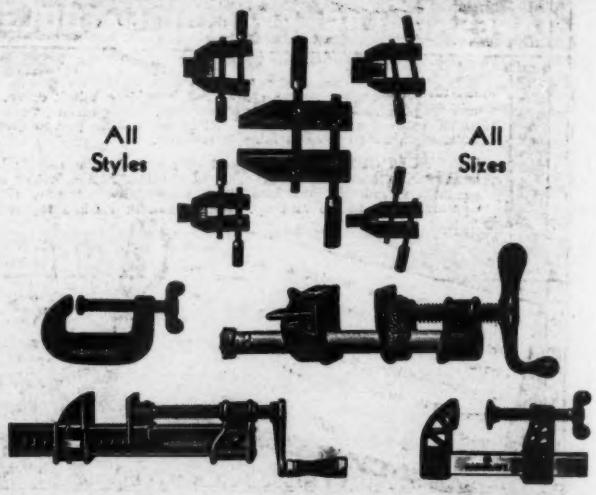

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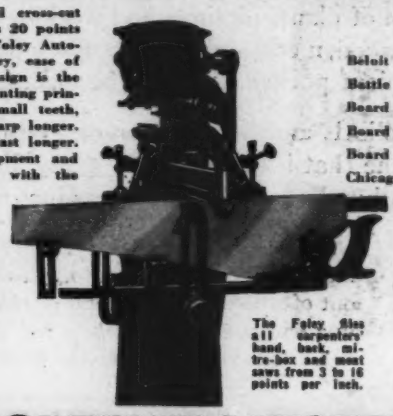
MODERN SAW FILING EQUIPMENT

This ONE machine files hand, band and cross-cut circular saws. It files back saws as fine as 20 points to the inch. The new 1940 Model F-16 Foley Automatic Saw Filer is unequalled for accuracy, ease of adjustment and long life. Its perfected design is the result of 40 years' experience. Patented jointing principle automatically evens up large and small teeth, so saws cut faster, truer, cleaner—stay sharp longer. Foley filed saws have less breakage and last longer. Train your students to use modern equipment and keep your saws sharp at lowest cost, with the

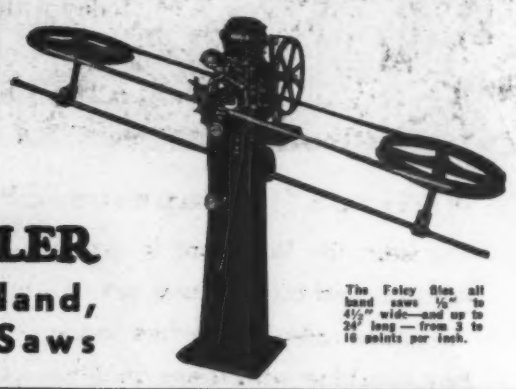


The Foley files all carpenters' hand, back, mitre-box and most saws from 3 to 16 points per inch.

The Foley files cross-cut circular saws from 3" to 16" in diameter. (up to 24" optional). Keeps saws in perfect circle.

FOLEY AUTOMATIC SAW FILER

One Machine Files Hand, Band and Circular Saws



The Foley files all band saws ⅛" to 4½" wide—and up to 24' long — from 3 to 16 points per inch.

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We want you to see for yourself in your own shop what a wonderful labor saving and efficient machine the Foley Automatic Saw Filer really is. Send for our booklet giving full details on new 1940 Model F-16 with many advanced features.

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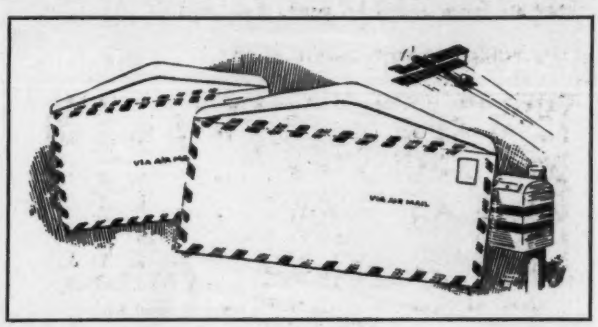

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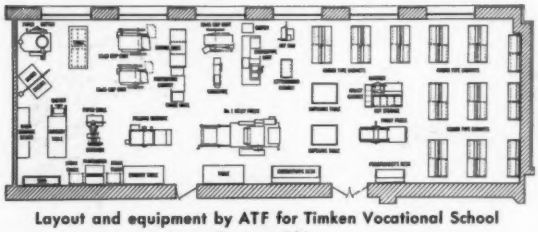
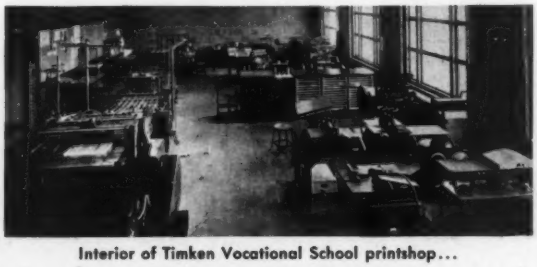


Layout and equipment by ATF for Timken Vocational School Canton, Ohio

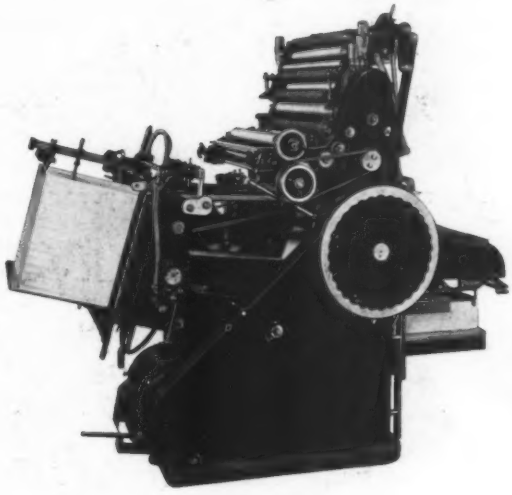
Here's a typical case of a well-known vocational school that was laid out by ATF for handling all essential operations in the most practical and economical manner. You, too, can avail yourself of this service for the asking.



Interior of Timken Vocational School printshop...

. . . and this is only one of many!

Large or Small . . .
Offset or Letterpress . . . *Ask* **ATF**

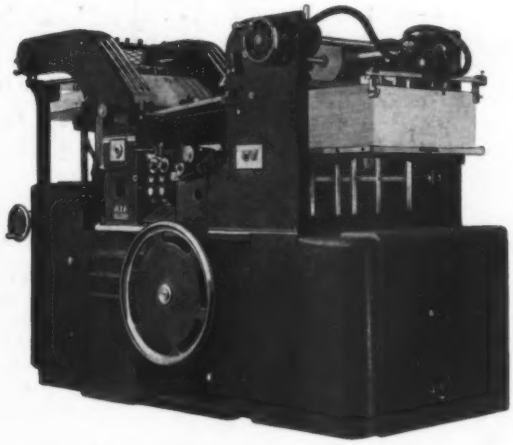


ATF-Webendorfer Chief "22" Offset Press

Largest Sheet: 17½x22½ inches Smallest Sheet: 8x10 inches

Also available in 14x20 and 22x29 sheet sizes

In addition to the famous ATF-Webendorfer Offset Presses, ATF makes an all metal Precision Camera, Vacuum Printing Frame, Developing Trough and Plate Whirler . . . complete equipment for the modern school offset plant.



ATF's Newest...The Kelly Clipper

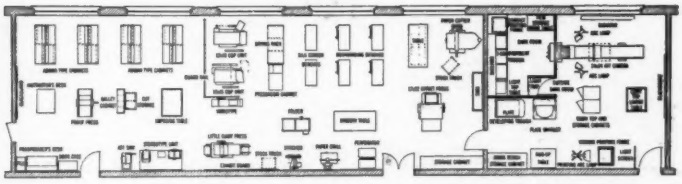
Largest Sheet: 14x20½ inches Smallest Sheet: 3¼x5½ inches

All ATF presses are motored by Kimble

Complete School Printshop Equipment f

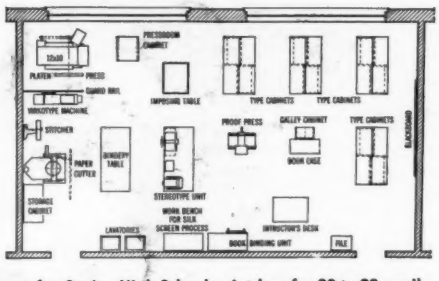
These Layouts are typical of hundreds prepared by ATF Engineers for school printshops all over the nation. Layouts like these help in the planning of your department, make your selection of presses, cabinets, cutters and other equipment easy and still stay within your appropriation.

Vocational School



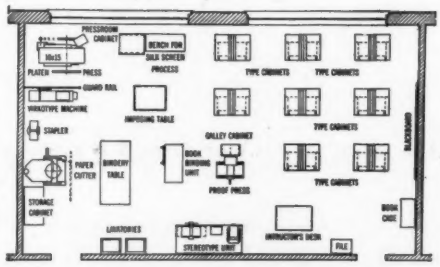
The ideal layout of letterpress and offset units for Trade Training classes to take care of 24 to 32 students. Approximate room size: 24x72 feet (letterpress); 24x27 feet (offset).

Senior High School



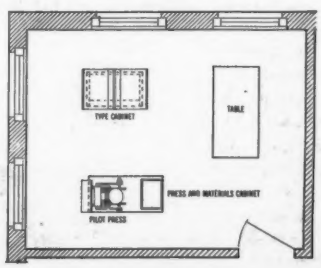
The ideal layout for Senior High School printshop for 20 to 23 pupils. Approximate room size: 22x45 feet.

Junior High School



The ideal layout for Junior High School printshop for 20 to 23 pupils. Approximate room size: 22x45 feet.

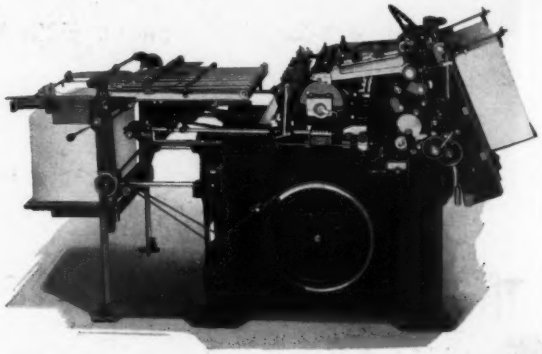
General School



The ideal layout for General (elementary) School printshop for 6 pupils. Approximate room size:12x15feet.

FOR THE COMPLETE SCHOOL PRINTSHOP . . . *Ask ATF*

Shown here are a few of the larger pieces of equipment from among those indicated in the layouts. You can get a complete listing and full description of all ATF School Printshop Equipment by checking the cut-out postcard and mailing it today . . . no obligation, of course.

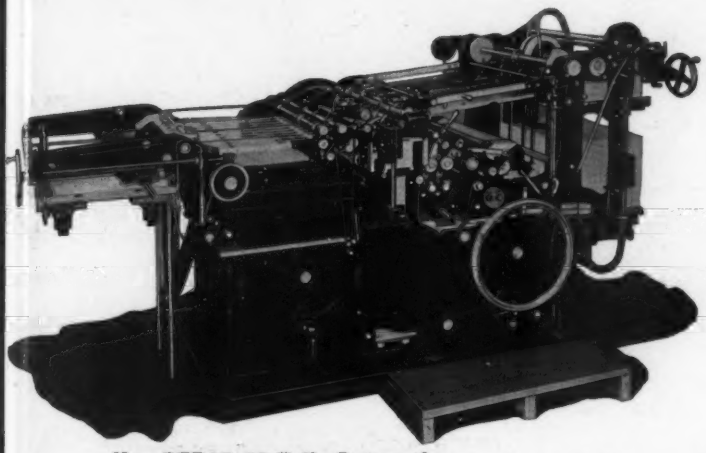


ATF Little Giant...ideally suited for Junior and Senior High School Printshops, and an excellent press for printing a school paper. Has all approved safety devices.

Boston Wire Stitcher...operated by foot pedal for saddle or flat stitching up to ½ inch thickness. Simple and fast in operation. Power driven models also available in all sizes.

New Series C&P Platen Press...available in three sizes: 8x12, 10x15, 12x18...A popular press found in nearly all school printshops.

for *Every Need* by ATF



New ATF 17x22 Kelly Automatic... a sturdy economical flat-bed cylinder press with all approved safety devices for the training of trade school students. An ideal press with which to prepare a student for a job... hundreds of ATF 17x22 Kellys are operating in commercial printing plants all over the world.

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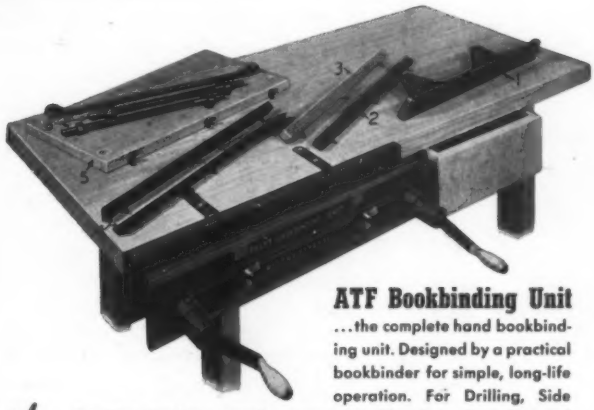
New C&P Craftsman Lever Cutter... a strong efficient paper cutter. Two-hand safety control eliminates danger.



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...the complete hand bookbinding unit. Designed by a practical bookbinder for simple, long-life operation. For Drilling, Side Stitching, Sewing on cords or tapes, Knocking down, Rounding and Backing, Edge Trimming, Hand Paper Cutting, Finishing and Pressing.

ATF Composing Room Saw
...undoubtedly the finest precision saw ever offered at so low a price. Extra *safe*... five other models to choose from.

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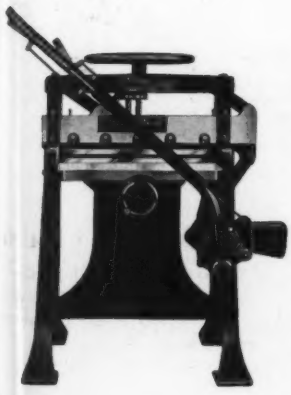

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New Challenge Lever Cutter
... sturdy construction, simple to operate. Equipped with two-handed safety device.

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- ☐ New Series C&P Platen
- ☐ Lever Paper Cutters
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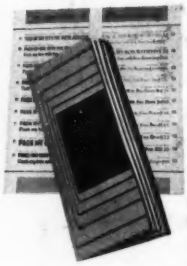

Familiarize your students with the various type faces in the Handy Index of American Types... lists over 200 type faces, grouped by style characteristics, width, height... convenient pica measure on each page. Send for your free copy today.

...and wherever type is set ...there you'll find ATF Type Cabinets

ATF Type Cabinets are the result of years of practical experience in equipping school printshop composing rooms everywhere. Each cabinet is designed especially for school use... so that work will flow through the school printing unit with the least effort and maximum efficiency. Made by famous Hamilton Manufacturing Company, specialists in equipping composing rooms since 1881. Check return card for complete listing.

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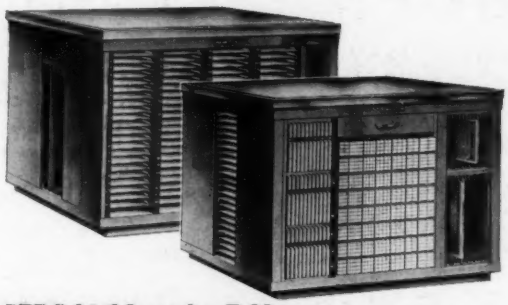
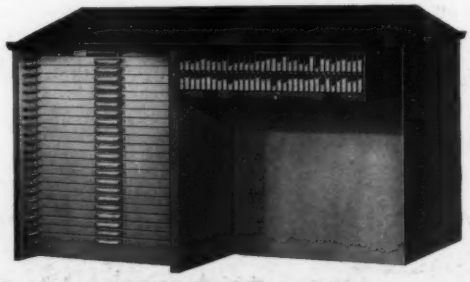
ATF Cut-Cost School Type Cabinet... Sturdy, seasoned hard wood construction... complete with job and font cases. Accommodates two students at a time. Ideal for the complete small school printshop.

New ATF Ideal School Type Cabinet... the aristocrat of High School Type Cabinets. Steel construction. Each feature designed to aid the student. Made to accommodate one student on each side.



ATF School Imposing Table... with Reglet, Furniture and Adjustable Chase Rack Units. Popular sizes 39x31 in. and 51x39 in.

ATF Double Tier Wall Steel Type Cabinet... sturdy, full size, commercial model cabinet. Ideal for the complete Vocational School Printshop. Available in many styles and sizes, wood as well as steel construction.



Improved ATF All-Steel Type Cabinet... ideal for Senior High Schools and Teacher Colleges. Accommodates four students at a time.

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- Emphasis is on airplane construction, the material on which is believed to be the most nearly complete presentation on the subject that has been published. After a discussion of materials and methods, a step-by-step picture of the building of a light, all-metal plane is presented. This leads to a description of how modern planes are manufactured in large factories. Maintenance and repair of modern planes follows, covering every phase from servicing the small private plane to the air transport, and military equipment. Best practices and newest methods involved in each phase are given.
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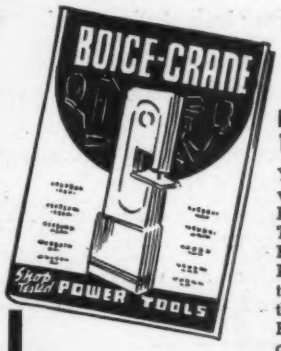

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Just think! Up to three times faster sawing; cuts so smooth hardly any sanding required; safety-sealed frame built like a skyscraper and *just as strong!*

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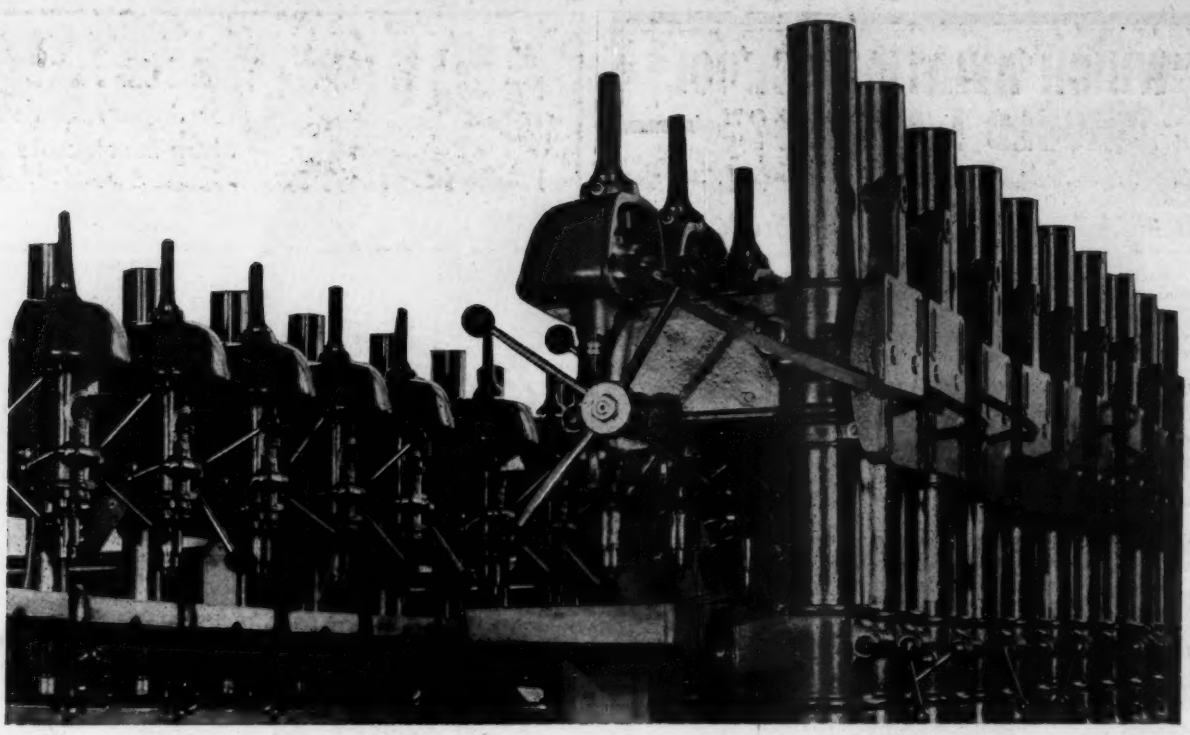

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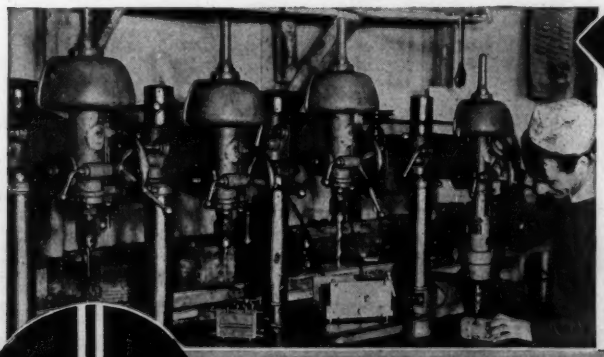
❷ There are no finer machine tools available—dollar for dollar—than those built by Walker-Turner.

❸ Walker-Turner Machines are widely used in industry. *Students trained on Walker-Turner Machines are well-fitted to step into industrial jobs.*

These are just three of the facts that point the way to a more profitable training program for your students. Your budget buys *more* facilities for training *more* students on *more* types of equipment, when you specify Walker-Turner Machines.

See these machines at the A. V. A. Exposition in San Francisco, booths 23, 24, 25, 26. Get more detailed information by sending for your copy of the Walker-Turner catalog at once. Address Walker-Turner Co., Inc., 19120 Berckman St., Plainfield, New Jersey.



ONE OF THE MANY multiple set-ups of Walker-Turner Bench Model Drill Presses devised by industrial plants. Operation of these set-ups is easy for students trained on standard Walker-Turner machines.

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